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CIVIL ENGINEERING.

Extract from the Report of the Directors of the Boston and Maine Railroad to the Stockholders, September 12, 1849.

"From the time that the Boston and Maine Railroad was opened to Dover, in the autumn of 1841, down to December, 1847, there was a very regular increase in its business of about 33 per cent. per annum, till its gross receipts for the last mentioned year amounted to over a half million of dollars. The Directors, finding the income of the road thus increasing, and then so ample, with a prospect of a continued increase from the works commenced or projected at Lawrence, and from new connecting roads, as well as from a continued growth of business in the towns and villages on the main line, reduced the fares and charges for freight about 14 per cent. But unfortunately the money pressure became severe, and about this time began to be felt in a *comparative* reduction of business and travel upon most of the railroads, the Boston and Maine with others; causing a great falling off in the operations at Lawrence, and reducing the business of the railroad with that place to a small part of what had been calculated upon. In the meantime, this Corporation was making large expenditures for the purpose of being prepared to accommodate the business to be expected from Lawrence, and from the connecting roads then about to be opened into the interior of New Hampshire and Maine; all which preparations had been ordered or approved by the Stockholders. In addition to these untoward circumstances, affecting unfavorably the income of the road, the loss of the Salmon Falls bridge and the Dover fire had their influence. All these circumstances operated together to prevent an increase in the net income of the road,

corresponding to the increased means and the increased expenditure. The effect, however, was not greater than should have been expected from such a complication of causes, all operating the same way. Notwithstanding all these disadvantageous circumstances, the net earnings of the road, over and above its expenses of operation and repairs, have been for the two years ending June 1st, 1849, an average of 8 per cent. per annum, and for the worst twelve months of this time, the last year, the net income was full 7 per cent.

"The result of this severe trial proves the unquestionable soundness of the enterprize; and it must give to the Stockholders and the public the greatest confidence in the future prosperity of the road."

Extract from the Report on the St. Lawrence and Atlantic Railroad, its Influence on the Trade of the St. Lawrence, and Statistics of the Cost and Traffic of the New York and Massachusetts Railroads. By A. C. Morton, *Civ. Eng.*

Looking at the favorable position of your road, connecting the Atlantic with the Western waters by the shortest practicable route, and extending down into the heart of the country requiring their breadstuffs, there does not appear to be any doubt that a very large portion of the supplies of the State of Maine, New Brunswick, and Nova Scotia, and parts of Vermont and New Hampshire, will be transported over your road and its branches, by which it will be delivered almost at the doors of the consumers.

The number of inhabitants within the States and Provinces above mentioned, who will receive their breadstuffs through this channel, and will otherwise contribute to its freight and passenger business, may, at the lowest estimate, be placed at eight hundred thousand souls.

The number of inhabitants in the vicinity of the road and its terminus in Canada is, at the present time, probably not less than one hundred and sixty thousand, and the total population in parts of Upper and Lower Canada, who will be benefitted by the road, and will contribute to its business, amounts to seven hundred thousand souls, making a total of one and a half millions of inhabitants who are directly or indirectly interested more or less in the construction of your road, and from whom you may expect business for its support. It is believed that, without reference to any supposed increase of the Western trade, your road, with so large a population for its support, would be a good dividend-paying road.

It will be found interesting and useful to refer to the practical working of the railways of the United States, and particularly those of Massachusetts directly illustrative of this subject. I have accordingly prepared tabular statements of a number of roads, showing the cost of construction, and of operating, the tons of freight and number of passengers transported, and the receipts for 1847.

By statement A, it will be seen that the thirteen roads embraced in the table have an aggregate length of 581½ miles, and have cost £7,721,423; that the total income was £1,295,475, and the expenses of running and maintaining these roads were £661,317, which, being deducted from the receipts, leaves a net annual revenue of £634,104, equal to $8\frac{2}{10}$ per cent.

on the whole cost. The expense of running, &c., was 50 per cent. of the receipts. There were transported over these roads 5,336,988 passengers, and 1,724,888 tons of merchandise.

The number of inhabitants in the whole State of Massachusetts, and the counties of the other States through which those roads pass, amount to about one million. It therefore appears that the number of passengers transported on these roads is over five times the population of the country in which they are located, and that the amount of merchandise transported is about $1\frac{3}{4}$ tons to each inhabitant.

The large amount of travel and tonnage compared with the population is extraordinary, and must be attributed to the effects of railroads in stimulating every branch of industry, and promoting greater intercourse among the masses of the people.

These results appear more surprising, when it is recollected that those roads are chiefly confined to the limits of one small State, or an area of less than 8000 square miles, and that many of them run nearly parallel, and some are in direct competition with each other.

On account of the different state of the country and its improvements, and the different character and pursuits of a portion of the inhabitants, we should not be warranted in applying this proportion of passengers to the population along your road as a basis of revenue, but if, instead of taking five times the population, which is the practical result in Massachusetts, we assume that the number of passengers will be only equal to the actual population, and assuming the amount of freight to be $\frac{1}{2}$ of a ton to each inhabitant in place of $1\frac{3}{4}$ tons, as shewn by the operation of those roads, it would appear a safe estimate of the business of your road, without reference to the great and increasing trade of the West.

Making a proper classification of the number assumed, (16,000,) and dividing them into "through" and "way" passengers in such proportion as the character of the business on your road appears to require, and applying the ordinary rates of transportation, we have, as the annual gross receipts for freight and passengers, ... £115,000
Deduct for expenses of running, management, &c., say 50 pr. ct., 57,500

Giving a net revenue of 57,500

Which is equal to about 7 per cent. on £850,000, the estimated cost of the road.

The Western Railroad is the only one embraced in the table before referred to, having a connexion with other improvements, by which it receives the benefit of western trade.

It more nearly than any other resembles your road as regards its length, connexions, and design, forming, with the Boston and Worcester Road, the last of the series of railways extending from Buffalo to the Atlantic, connecting also with the Erie Canal at Albany. It, however, differs from it in the larger amount of curvatures and heavier grades, the maximum inclination being 83 feet per mile.

It has to contend with strong competition with another railroad, and with the Hudson river during the season of navigation, yet, notwithstanding these disadvantages, and its extravagant cost, the net revenue in 1847 amounted to 8 per cent. on £2,192,000, its present cost.

The gross receipts, the first year, after the whole line was opened, and before its connexions were perfected, were £919 per mile of road, which, if applied to your road, the length of which is 127 miles, would produce £116,713, or deducting 50 per ct. for expenses, a net revenue of £58,356, which is nearly 7 per cent. on the estimated cost. It is, however, maintained that the position and connexions of your road, as a channel through which the western trade may reach the seaboard, are far superior to this.

The St. Lawrence river, with its ship canals, and the great lakes, opens an inland navigation, which, for its extent, capacity, and economy of transportation, is not surpassed by any in the world.

The total distance through the St. Lawrence and the lakes to Chicago, from Montreal, is 1330 miles, and in this distance there are but 66 miles of canal navigation. If we include the navigation of Lake Superior and Strait St. Mary's, which require but about one mile of canal to perfect the navigation, and which will soon be completed, we have a total extent, including the distance laterally to Chicago, of 1726 miles, having only 67 miles of canal navigation.

The Welland canal is designed for vessels of 400 tons, and the St. Lawrence canals for vessels of much larger tonnage. These improvements are completed, and were first brought into use last year.

This channel of trade, therefore, is not yet fully known or appreciated, and there has not yet been time to realize the benefits which will result from experience and improvements in the manner of conducting the business of transportation, and the effects of competition in lowering rates.

The amount of up trade has an important bearing on the cost of down freight; and this being largely increased by the completion of your road, will doubtless still further reduce the rates of transportation.

The following table exhibits the leading features of the route from Cleveland to Boston, *via* the Erie Canal and Western Railroad, and the St. Lawrence route, from the same point *via* the Portland Railway to Portland.

Routes.	Length of Lake and River Navigation—miles.	Length of Canal Navigation—miles.	Tonnage of Vessels—tons.	No. of Transhipments.	Length of Railway—miles.	Maximum Grade—feet per mile.	Time occupied in reaching Seaboard—days.
To Boston, *via* Erie Canal and Western Railroad,	200	363	*80	2	200	83	14
To Portland, *via* St. Lawrence River and Portland Railway,	534	66	400	1	275	50	8½
Difference,	334	297	320	1	75	33	5½

* Taking one of the heaviest laden boats per day, which arrived at West Troy from Black Rock, the average for the year 1848 was 71½ tons. (Canal Commissioners' Rep., Jan., 1849.)

The following statement exhibits the cost of transporting flour per barrel on these routes.

Erie Canal Route.

From Cleveland to Buffalo,	12 cents.
" Buffalo to Albany,	70 "
" Albany to Boston,	30 "
Total to Boston,	112 "
If carried thence to Portland,	10 "
Total to Portland,	122 "

St. Lawrence Route.

From Cleveland to Montreal,	40 cents.
" Montreal to Portland,	45 "
Total to Portland,	85 "
If carried thence to Boston,	10 "
Total to Boston,	95 "

From this it appears that, adopting the average rates of transportation on the Erie Canal of the lowest month in each year, for a number of years, which is 7 cents per barrel less than the average of 1847, and the lowest summer rates on the Western Railroad, the cost of delivering flour at Boston is 112 cents per barrel, and if forwarded to the State of Maine, an addition of 10 cents, making a total of 122 cents per barrel.

By the St. Lawrence route, the cost of delivering a barrel of flour, allowing the charge on the Portland Railroad to be 45 cents per barrel, and taking the actual rate at which it has been carried from Cleveland to Montreal, (40 cents,) we have a total charge of 85 cents, making a difference in favor of the route *via* the Montreal and Portland road to the seaboard, of 27 cents per barrel.

If, however, we make the charge on the Portland road, without reference to the difference in grades, the same, in proportion to its length, as is charged on the Western Railroad, the cost will be reduced to about 41 cents, or a total from Cleveland to Portland of 81 cents, giving a difference of 31 cents per barrel in favor of the St. Lawrence route.

Making Boston the terminus of both routes, there is still a difference of 17 cents per barrel in favor of the St. Lawrence route *via* Portland to Boston.

The difference in time required to perform a passage from Cleveland to the seaboard, is 5½ days in favor of the St. Lawrence and Portland route.

The greater extent of canal navigation, and an additional transhipment, add not only to the time required, but materially increase the cost of transportation on the Erie Canal route over that of the St. Lawrence.

The former has 363 miles of canal navigation, while the latter has only 66 miles, and most vessels navigating the St. Lawrence pass down the river instead of the canals, so that in the downward passage there are but about 36 miles of canal navigation.

The Erie Canal is navigated by vessels of small tonnage, drawn by horses at the rate of 2½ miles per hour, while the Welland and St. Lawrence Canals are navigated by steam vessels which pass through the lakes and the river to Montreal, without breaking bulk, in half the time, and

with about four times the number of tons in each cargo. The vessels on the former route can carry from 700 to 800 barrels of flour, but those of the latter carry 3000 barrels.

These disadvantages of the Erie Canal route cannot be overcome by the enlargement of the canal or other improvements.

It may be said that the Oswego route to Albany is preferable as regards cost and the time required to make the trip. Grant that this is the case; the difference is not enough to affect the comparison materially.

The distance is about the same, and there are still 237 miles of canal navigation, an increased amount of lockage of about 200 feet, with the same disadvantages of small cargoes and transhipments as by the Erie Canal route.

The estimated number of passengers for the Boston and Worcester Road, before it was completed, was 23,500, and before the opening of the Norwich and Worcester and Western roads, which connect with it, they amounted to 78,000, and in 1847 to 548,000. The number of passengers estimated to pass over the Eastern Road was 121,700; in 1847 the actual number transported was 893,000. The estimated number for the Fitchburg Road was 71,790; there were transported the first half year, with only half that road in operation, nearly 10,000 more passengers than were estimated for the whole road the whole year, and in 1847 the number was 484,000. The passengers estimated to pass over the Boston and Lowell Road were 37,400, and the net receipts were estimated at $36,000; the former amounted in 1847 to 484,000, and the latter to $195,000.

The astonishing increase of trade on the Western Lakes within a few years, is such as to render it difficult to assign any proper limits to its future advances.

In 1835, the State of Ohio was the only exporting State on the lakes, and during that year there arrived at Buffalo 86,000 barrels of flour, and 98,000 bushels of wheat.

The following statement shows the amount of the principal productions of the Western States which arrived at the same port in 1845 and 1847, and the increase.*

Year.	Flour. barrels.	Pork and Beef. barrels.	Staves. M.	Wheat. bushels.	Corn, Oats, & Rye. bushels.	Butter. kegs.
1847	1,857,000	80,000	8,800,000	6,489,100	3,379,087	101,584
1845	746,750	57,060		1,770,740	78,470	19,975
Increase	1,110,250	22,940		4,718,360	3,300,617	81,605

The above is exclusive of the large amount of lake trade which went through the Welland Canal.

In 1837, the wheat and flour passing Lakes Erie and Ontario, to be forwarded to market through the Erie Canal, amounted to only about 35,000 tons, while in 1847 the amount was 486,000 tons.

* Compiled from the Report of the Commissioner of Patents, to Congress, 1847.

By referring to the amount of shipping on the lakes at various periods, its tonnage and value, and the value of the commerce, we may, perhaps, form a more just appreciation of its importance, and the astonishing increase of trade within a few years.

In 1825, there were but thirty or forty small craft and one steamboat of 350 tons burthen on Lake Erie, and the first steamboat passed through Lake Michigan in 1826 or 1827.

In 1845, there were on the Lakes, above Niagara Falls, 60 steam vessels, having an aggregate tonnage of 23,000 tons, and 320 brigs and schooners of 53,000 tons, the whole costing $4,600,000.*

The shipping of all the lakes in 1846 amounted to 136,836 tons, and was valued at $6,000,000. The amount of merchandise transported that year was 3,861,088 tons, while that of 1841 was 2,071,802 tons, showing that the trade had nearly doubled in five years. The number of passengers transported in 1846 was 250,000, and the value of this business was estimated at $1,250,000.†

The value of lake commerce in 1847, according to the Report of the Hon. Washington Hunt, made to Congress, was over $141,000,000, or only $13,000,000 less than the value of all the exports of the United States in 1848, and nearly double the value of all the products received at New Orleans in 1846–7 by the Mississippi river.

In all the immense territory which surrounds the great lakes, and which now produce this surprising amount of commerce, there was in 1816 but one organized State, and the total population did not exceed 500,000 souls.

At the present time, there is a cluster of six large States about these waters, containing a population of between four and five millions of inhabitants.

Embracing the States and Territories whose trade will float over these lakes to an eastern market, we have an area of nearly 300,000 square miles, or an extent of territory three times as large as the Kingdom of Prussia, and nearly twice as large as France.

Tabular Statement of the Length and Cost of the Railways from Albany to the Falls of Niagara, and net income in 1848, as compiled from the official returns made to the State Engineer and Surveyor, January 20, 1849.

Name of Railroad.	Length of Road in miles.	Total Cost.	Average cost per mile.	Net revenue per cent. on cost.
Albany and Schenectady,	16·91	$1,606,196	$94,985	6·2
Utica and Schenectady,	78·00	3,227,946	41,384	10·4
Syracuse and Utica,	52·80	1,968,036	37,273	13·1
Auburn and Syracuse,	26·00	1,125,886	43,303	9·1
Auburn and Rochester,	78·00	2,644,520	33,904	10·0
Tonawanda,	43·50	974,865	22,410	18·2
Attica and Buffalo,	31·50	821,313	26,073	10·3
Buffalo and Niagara Falls,	22·00	250,396	11,381	14 2
	348·71		Average,	12·2

* Letter on Lake Commerce, 1846; by James L. Barton, Esq.

† Report to Congress of J. J. Abert, Col. Corps Top. Engineers, 1848.

AMERICAN PATENTS.

List of American Patents which issued in the month of March, 1849, *with Exemplifications, by* CHARLES M. KELLER, *late Chief Examiner of Patents in the U. S. Patent Office.*

1. For a *Machine for Trimming, Smoothing, and Folding Cotton Cloth;* John Higgins and Hiram H. Higgins, East Greenwich, Kent county, Rhode Island, March 10.

Claim.—"What we claim is the before described new organization of horizontal and vertical cylindrical brushes and a set of draw rollers, as arranged, combined, and operating together, in manner and for the purpose designated.

"We also claim the revolving cylindrical brushes, (either with or without the vertical brushes,) the set or system of draw rollers, and the folder or folding apparatus, in combination with one another, and arranged and operating together in the manner and for the purpose explained."

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2. For an *Improvement in Looms for Weaving Brussels Carpets, &c.;* Erastus B. Bigelow, Boston, Massachusetts, March 10.

The patentee says,—"My improvements consist in the manner in which the wires, over which the pile is wrought, are introduced between warps."

Claim.—"What I claim as new, is the toothed guides, employed in the manner and for the purpose set forth, or in any other way which shall accomplish the same end by analogous means. I also claim the combination of the toothed guides with the wire box or trough."

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3. For a *Punching Machine with a Combination of Adjustable Gauges;* Richard S. Tilden, St. Louis, Missouri, March 10.

Claim.—"What I claim as my invention, is the combination of the graduated scale rods and adjustable gauges with the movable gauges, and also, the combination of the said graduated scale rods, and adjustable and movable gauges, with the series of dies and punches."

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4. For an *Improvement in Fire Escapes;* George A. W. Hüttman and Geo. K. Kornelio, Philadelphia, Pennsylvania, March 10.

The patentees say,—"The principle upon which we construct the elevating and supporting frame of our ladder, is that of forming two or more sets, of two pairs each, of folding jointed lattice pieces, or oblique braces, capable of being placed at different angles with each other, or of being folded down upon each other in a compact form, and thus rendered portable in a carriage not larger than that of an ordinary fire engine. Each of the pairs of folding pieces, or braces, is connected by a bolt through its centre, with a third bar shorter than the other two, and which, when the frame is elevated, and the platform or scaffold carried to its full height,

stand in a vertical position, while all the other frame pieces are inclined in a given angle to each other, and to the horizon. Our ladder, when elevated, is either a stair case, with the flights of steps alternately placed on one side and the other, within the lattice framework, or a series of common or of flexible ladders."

Claim.—"What we claim as our invention, is the manner of bringing the upright or vertical jointed bars of the framework into their erect position, by means of the tumbling shaft, slat, pin, arm, and flap, when acted upon by the horizontal frames, which are moved towards each other by a right and left hand screw, or other equivalent machinery.

"We also claim the manner of bringing into their position on the notched revolving block, and of sustaining thereby, the vertical jointed bars, as likewise that of removing the feet of the upright from said blocks, when the frame is to be lowered, in the manner and for the purposes set forth."

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5. For an *Improvement in Stoves for Heating Apartments;* James Shields, City of New York, and James Cole, Cincinnati, Ohio, March 10.

The patentees say,—"The nature of the first part of our invention consists in combining the chamber of combustion, in which the fuel of any desired kind is burned, with a drum or chamber for the combustion and circulation of the inflammable matter evolved from the combustion of the fuel, by means of what we term a 'throat,' through which the products of combustion pass from the chamber of combustion to be inflamed in the said throat and drum.

"The second part of our invention consists in admitting a jet or jets of atmospheric air to the throat which forms the communication between the chamber of combustion and a drum or furnace chamber, that the inflammable gases evolved from the combustion of the fuel, in the fire chamber, may be mingled with the atmospheric air in their passage through the throat, and be thereby inflamed, and pass, in an inflamed and inflaming state, into the drum, or heating or working chamber of a furnace, that the flame may circulate beyond the throat, and then return to the exit pipe, which, in a vertical apparatus, is placed below the upper aperture of the throat, the equivalent position being retained when the position of the apparatus is changed, this arrangement preventing the flame from taking a direct course to the discharge pipe.

"The third part of our invention consists in making the lower aperture of the throat larger than the upper aperture thereof, that the inflammable gases and atmospheric air may be the better co-mingled in their passage through the throat, and thereby insure a more perfect combustion.

"The fourth part of our invention consists in making the throat with an enlargement between the lower and upper apertures, that the gases that enter the throat from the chamber of combustion may have room to mingle with the supply of atmospheric air, before they pass up and out of the smaller aperture above into the drum."

Claim.—"What we claim as our invention, is, 1st, admitting atmospheric air to the throat which forms the communication between the chamber for the combustion of the fuel, and the drum, that the inflammable gases evolved from the combustion of the fuel in the fire chamber, may be

mingled therewith in passing through the said throat, and be thereby effectually inflamed, and pass in an inflamed and inflaming state into the drum.

"2d, We claim making the lower aperture of the throat, that forms the communication between the fire chamber and drum, larger than the upper aperture thereof, that the inflammable gases and atmospheric air may be the better co-mingled in their passage through the throat, and thereby insure a more perfect combustion.

"And finally, we claim making the said throat with an enlargement between the upper and lower apertures thereof, that the gases that enter the said throat may have room to mingle with the supply of atmospheric air, before they pass up and out of the smaller aperture above into the drum."

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6. For an *Improvement in the Delivery and Take-up Motion of Looms;* Amos H. Boyd, Saco, York county, Maine, March 10.

Claim.—"What I claim as my invention, is the combination of a set of two or more feed rollers, and mechanism for operating them, with the yarn beam and take-up motion or mechanism of the loom; the whole being arranged and made to operate together as specified; the said feed rollers serving not only to firmly hold the warps under the beating up action of the reed, but to deliver them out at the rate required."

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7. For an *Improvement in Cotton Presses;* Thomas Ashcraft, Randolph county, Alabama, March 6.

Claim.—"What I claim as new, is the combination of the movable end board, its guides and supporting wedges, with the moving packing box and stationary platen. I likewise claim constructing the press box with the upper part of its sides and ends slightly inclined outwards."

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8. For *Improvements in the Let-off Motion of Looms,* Jeremiah Myers, Biddeford, York county, Maine, March 10.

The patentee says,—"My invention is what may be termed a 'positive' let-off mechanism, or combination of mechanism, its object being to regulate the rotary movement of the warp beam, in such manner that the warps may be delivered from it in a regular and uniform manner. Also, that, when the motions of the lay are arrested by what is termed the stop-motion, or stoppage of the loom, the said rotary movement of the warp roller may be simultaneously stopped."

Claim.—"What I claim as my invention, is the combination composed of the gear, screw, shaft, ratchet wheel, pawl, lever, bar, a bent lever, composed of the arm V, shaft W, and arm *i*, or otherwise properly made, roller, one or more cams, the spring, the slide plate, and arm P and weight, as applied to the warp beam and roller, and made to operate together as specified.

"And I also claim, in combination with the above described mechanism for operating the warp roller, the stop-motion or mechanism applied to the same, and the spring stop lever of the loom, the said stop-motion consisting of the shaft, and its arms, rod, notched lever, and its spring."

9. For an *Improved Spike Machine;* Marcus Maxim, Newcastle, Mercer county, Pennsylvania, March 10.

The patentee says,—"The nature of my invention and improvement consists in a certain new and useful combination of dies, so shaped, and arranged, and operated, that their combined action, at their appointed times, flattens or points the forward end of the spike rod, simultaneously with the operation of finishing the sides and point of a spike previously cut from the spike rod, and passed into a set of finishing dies; then heading the spike and discharging it in a finished state; and then advancing the spike rod, thus previously pointed, into the finishing dies, and, whilst therein, having a portion of it cut off for another spike; the several operations of pointing the spike rod, finishing the point of the spike, heading the spike, and discharging the finished spike, being performed at every revolution of the cam shaft of the machine.

"Also in the use of a sliding guide and holder, which holds the spike rod on the bottom die whilst a portion of it is cut off for a spike, said spike and holder retiring out of the way while the spike is being pressed in the dies.

"Likewise in a novel arrangement and application of a gauge, for gauging the length of the piece of iron cut off from the spike rod, to form a spike, and for conveying it, when cut off, to the heading die. And in a new arrangement of a stationary cutter, for cutting the piece of iron to form the spike from the rod."

Claim.—"What I claim as my invention, is the combination of the dies, gauge hold, and cutter, arranged and operating as described, for making wrought spikes from a spike rod in a cold or heated state; the spike rod being flattened at one end, and the spike gauged, pointed, headed, and discharged, at every revolution of the cam shaft."

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10. For a *Machine for Cutting Teeth for Beveled Gear;* Geo. H. Corliss, Providence, Rhode Island, March 10.

The patentee says,—"The first part of my invention consists in the use of a reciprocating cutter, governed by a guide bar, on which the cutter carriage slides, and which has its axes of vibration, to adapt the cutter to the required depth of cogs, at the apex of a cone corresponding with the bevel of the wheel to be cut, whether such axes be fixed or adjustable to wheels of different sizes, that all the cuts may be in the direction of the radii.

"The second part of my invention consists in combining the guide bar, on which the cutter carriage runs, with a secondary frame, hinged to the main frame, outside of the circle of the largest wheel intended to be cut in the machine, that the axis of vibration of the guide bar may be elevated or depressed, to adapt the machine to different bevels, and that the main driving shaft, which communicates motion to the operative parts of the machinery placed at the hinged end of the said frame, may be in the line of the axis of vibration of the said frame, that the vibration thereof may not change the relative position of the driving shaft, and the parts receiving motion therefrom.

"The third part of my invention consists in combining with the guide

bar a guide plate, against which it bears by means of a weight, spring, or the equivalent thereof, so that, as the guide bar descends to give the proper depth to the cogs, the said guide bar shall follow the curve of the guide, and thus determine the form of the face of the cogs.

"And the last part of my invention consists in making that part of the rear end of the guide bar which rests against the guide, movable, so as to have an endwise motion in or on the said bar, in the direction of its length, the said movable part or stem being beveled back of where it rests against the guide, and so connected, either with the guide bar or some other part of the machinery, that, at the time of the cutting motion, it will move forward, that its bevel surface may be brought in contact with the guide, and give a lateral motion to the guide bar, to relieve the cutter from the surface of the cog that is being cut, to admit of its moving back clear of the cog, and then, at the end of the return motion, a reversed motion, to bring the cutter in the proper line for cutting."

Claim.—"What I claim as my invention, is, 1st, the method of cutting the cogs of beveled wheels, by means of a reciprocating cutter, that moves in or on a slide, (or slides,) that vibrates on an axis that coincides, or nearly so, with the apex of a cone representing the bevel of the wheel to be cut, by which vibration the depth of cut is determined; and this I claim irrespective of the adjustment of the axis of vibration.

"2d, I claim the guide bar (or its equivalent) on which the cutter carriage runs, and having its axis of vibration for the depth of cut as above described, when combined with a secondary frame, jointed to the main frame at some point outside of the circumference of the wheel to be cut, that the machinery may be adapted to the cutting of cogs on various bevels.

"3d, I claim, in combination with the guide bar, having an universal joint, or the equivalent thereof, and operated as described, in combination with the guide plate, to guide the cutter and determine the form of the face of the cogs.

"And lastly, I claim making that part of the guide bar which rests against the guide plate, to determine the form of the face of the cogs, separate from, and movable on, the guide bar, and properly beveled to relieve and clear the cutter for its back movement."

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11. For an *Improvement in Cut-off and Working the Valves of Steam Engines;* George H. Corliss, Providence, Rhode Island, March 10.

The patentee says,—"The object of the first part of my invention consists in supporting the shaft of the working beam on two vertical standards, that are erected on two horizontal beams secured and resting at the ends on the bed, the upper end of the two standards being connected to, and braced with, the ends of the horizontal beams by means of diagonal tension screw braces.

"The second part of my invention consists in communicating motion to the two valves from one rock shaft, by connecting each valve with a separate arm or crank-wrist of the rocker, the two arms making such an angle with each other, that the point of connexion of the closed valves shall vibrate near the dead point, while the other, which is being opened and

closed, is moving along that part of its circuit which shall give the greatest longitudinal motion.

"The third part of my invention relates to the method of regulating the cut-off of the steam in the main slide valves, and consists in effecting this by means of the governor which operates cams, so that, when the velocity of the engine is too great, these cams shall be moved by the centrifugal action of the regulator, that a catch on the valve rods may the sooner come in contact with them, to liberate the valves and admit of their being closed by the force of springs or weights, and thus cut off the steam in proportion to the velocity of the engine."

Claim.—"What I claim as my invention, is, 1st, the method of operating the slide valves of steam engines, by connecting the valves that govern the ports at opposite ends of the cylinder, with separate arms of the rock shaft, or the mechanical equivalents thereof, so that, from the motion thereof, the valve that keeps its port or ports closed, shall move over a less space while its port (or ports) is closed, than the one that is opening its port or ports, and vice versâ, while at the same time the two arms by which they are operated have the same range of motion, whereby I am enabled to save much of the power heretofore required to work the slide valves of steam engines, and by which, also, I am enabled to give a greater range of motion to the valves at the periods of opening and closing the ports, to facilitate the induction and eduction of steam. And lastly, I claim the method of regulating the motion of steam engines, by means of the centrifugal regulator, by combining the said regulator with the catches that liberate the steam valves, by means of movable cams or stops, as described."

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12. For an *Improvement in Drying Grain;* Henry Quinn, New Alexandria, Hunterdon county, New Jersey, March 10.

The patentee says,—"The object of my invention is to reduce the cost of the apparatus and its liability to derangement, and, at the same time, to dry the grain with a reduced consumption of fuel, all of which I effect by causing the grain to descend from a hopper, over and down a heated inclined plane to a stationary drying pan, over which it is moved slowly by a rake."

Claim.—"What I claim as my invention, is the method of drying grain in an open stationary pan, having the fire and draft below it, with the rake above, for stirring the grain and causing it to pass from the feeder to the delivery, as described, whereby the moisture in the grain is more readily evaporated and liberated, and the apparatus constructed at less cost, and with less liability to derangement, than by any other plan before known, when this is combined with the feeder heated by a hot air chamber, whereby the grain is gradually heated in the feeder, to draw out the moisture, before it is exposed to a higher temperature in the pan to be evaporated."

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13. For an *Improved Tubular Two-part Rail;* John Elgar, Baltimore, Maryland, March 10.

The patentee says,—"My invention consists in forming a rail that shall

combine, as near as may be, the properties of a rail were it made in one piece, without joints, the whole length of the line of railway."

Claim.—"What I claim, is the forming of each part of a two-part compound break-joint rail as described, so that, when bolted together with a vertical joint, they form a tube. And I also claim, in combination with said rail, a core of iron, inserted at each semi-cross joint in the hollow of such a rail, with the view of obtaining equal strength at those points with any other part, and of holding each part in its place vertically at the cross-joints. I claim the staunchion, to be bolted or nailed to the side of the sleeper for the support of the rail."

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14. For an *Improved Door Lock by a Combined Key and Gauge; also, a Thief Detector;* Francis C. Goffin, Philadelphia, Pennsylvania, March 10.

Claim.—"What I claim as my invention, is the thief-detecting slide, in combination with the tumblers and the protuberance, and the springs and levers by which it is operated, and the key gauge or register, in combination with a key having sliding bits."

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15. For an *Improvement in Rope Machinery;* Wm. Joslin, Waterford, Saratoga county, New York, March 10.

The patentee says,—"The improvements I have made in my patented machine relate to the employment of, 1st, a combination of rubbers, levers, sliding connecting rods, tribranched connecting plate to which the rods are attached, and a tribranched lever, and sliding weight suspended to an inclined arm of said tribranched lever, and a movable graduating rod for governing the descent of the weight over the inclined arm of the lever, for producing the requisite degree of friction on the bobbins, for the purpose of causing the several strands to have the same degree of tension on leaving the spools. 2d, In the employment of two expansive pulleys, revolving with the flyer, for graduating the twist of large or small rope. 3d, In the employment of a sliding toothed band or ring, placed over the periphery of a wheel on the axle of the expansive pulley, endless chain, friction bars, spring, and screw to graduate the friction of the band, for causing the reel to reel the cordage at a uniform degree of speed. 4th, In the employment of horizontal parallel rods, arranged between the inner standard of the spool frame and the inner standard of the flyer frame, and let into the same."

Claim.—"What I claim as my invention and improvement on my patented machine for making cordage, is, 1st, the manner of producing and diminishing the friction on the bobbins, so as to keep up a uniform strain on the strands as they are drawn off. Also, to prevent kinking and too fast unwinding.

"2d, I likewise claim the employment of the sliding toothed ring and endless chain, in combination with the toothed pulley and perforated wheel, friction bars, spring, and screw, for graduating the friction on the toothed band, to cause the reel to wind up the rope as fast as delivered from the expansive and contractile pulleys."

16. For an *Improvement in Cultivators;* Jeremiah Warner, Reading, Berks county, Pennsylvania, March 13.

The patentee says,—"The nature of the first part of my invention relates to the mode of adjusting the teeth relatively to one another along the breadth of the frame. And the second part of my invention relates to the adjustment of the cutting edge, so as to cut in more or less."

Claim.—"What I claim as my invention, is connecting the teeth of cultivators to the frames thereof, by attaching them to blocks adapted to slide in the frame, and provided with screws for regulating their position relatively to one another, and to the draught beam.

"I also claim as my invention, connecting the teeth by means of a hinge or other turning joint, and provided with the jointed screw brace, the said joints and screw braces being attached to the sliding blocks to which the teeth are attached."

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17. For an *Improved Horizontal Spark Arrester;* T. Willis Pratt, Springfield, Hampden county, Massachusetts, March 13.

The patentee says,—"The nature of my invention consists in the formation of a spark arrester, and its connexion with the fire box of a locomotive, so as to give great surface for wire gauze or perforated plate, for the passage of the smoke, and a ready discharge for the sparks into the fire box, while, at the same time, the symmetry of the engine is kept up, and a very small surface is exposed to the resistance of the air in running."

Claim.—"What I claim as new, is the cap or horizontal pipe, with perforated top expanded, and connecting with the fire box."

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18. For an *Improvement in Double Scale Balances;* Thaddeus Fairbanks, St. Johnsbury, Caledonia county, Vermont, March 13.

Claim.—"What I claim as my invention, is the graduated scale, and sliding or movable weight thereof, in combination with the balance beam, having arms of equal lengths, and its two scale pans or platforms for sustaining weights, the whole being constructed and made to operate in manner and for the purpose specified."

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19. For an *Improvement in Apparatus for Operating Shuttle Boxes of Looms;* James A. Bowie and Charles Carr, assignees of Robert B. Goodyer, Philadelphia, Pennsylvania, March 13; (anté dated September 13, 1848.)

The patentees say,—"The nature of our invention and improvements consists in the application of a new and more simple method of raising the shuttle boxes, by means of which almost an infinite number of patterns may be woven."

Claim.—"What we claim as our invention, is the combination of the index wheel, having movable pins of different lengths, with the shoe, having projections adapted to the pins, for the purpose of raising and falling the shuttle boxes."

20. For an *Improved Combined Railroad Bar;* Alfred B. Seymour, Bordentown, Burlington county, New Jersey, March 13.

Claim.—"What I claim as my invention, is making rails in two parts, divided by a longitudinal and vertical plane, when brought together and united by breaking joints, and secured by screw bolts, keys, or their equivalents, so that the junctions of the sections of one part shall be in the middle, or near the middle, of the sections of the other part.

"And I also claim making a recess or groove at the junction of the two parts of the rail at the top, that the iron, when beaten down by the action of the wheels of railroad trains, may spread therein, without having a tendency to force apart the two halves, and strain the securing bolts or keys."

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21. For an *Improvement in Regulating Forebays;* Henry Mallow, Upper Tract, Pendleton county, Virginia, March 13.

The patentee says,—"The nature of my invention is such as to regulate the flow of water to two or more water wheels, receiving their water from the same forebay."

Claim.—"What I claim as my invention, is the method of regulating the supply of water from one and the same forebay, to different water wheels, or other movers of machinery driven by water, by means of a partition or partitions, over which water not required for the steady action of one wheel, or series of wheels, may pass to one or more other wheels, which do not require constant and invariable supplies.

"I also claim the use of the above manner of regulating the water of a forebay by partitions, in combination with one or more swinging gates attached to said partitions, so adjustable as to regulate, change, or reverse the course of the current of water, and also in combination with the regulating waste gates."

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22. For an *Improvement in Spring Shanks for Boots and Shoes;* John McGinley, Philadelphia, Pennsylvania, March 13.

Claim.—"What I claim as my invention, is the position of the slot and sliding part of the spring shank within the boot or shoe heel, for the purpose of being protected from injury."

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23. For an *Improvement in Balances for Weighing;* Maria L. Eastman, assignee of Robert Eastman, Concord, Merrimack county, New Hampshire, March 13.

Claim.—"What I claim as my invention, is the improvement or combination as applied to a scale beam, and composed of the following elements or their mechanical equivalents, viz., 1st, the suspended platform; 2d, the series of one, two, or more weights; 3d, a lowering and lifting apparatus, the same consisting of the cone, slide bar, and catch; the whole combined and made to operate together as described. And, in combination with the said lifting and lowering apparatus, I claim the scale of figures on the slide bar, and the hole made through the post, or their equivalents."

24. For an *Improvement in Cotton Presses;* William J. Johnson, Mobile, Alabama, March 13.

Claim.—"What I claim is, 1st, the combination and arrangement of the circular revolving platform and radial presses, for conveying uncompressed bales of cotton or other substances to the steam cylinder, to be compressed, simultaneously with the operation of conveying compressed bales from the cylinder, to be tied; by which all the hands attending the various parts of the machine are kept constantly employed during the operation of the steam engine, whether the revolving circular platform be made, arranged, and operated in the manner herein described, or other mode which may be substantially the same.

"2d, I claim the combination and arrangement of the jointed arms, levers, slotted arms, and triangular plates, as connected with the follower and head block, for preventing the descent of the follower, when detached from the lifting hooks of the steam engine, before the ropes are tied.

"3d, I claim the mode of conveying the ropes for tieing the bales through the grooves of the head and tail blocks, by means of the conveyors, during the operation of compressing a bale, simultaneously with the ascent of the follower, and then returning the conveyors to their original positions, simultaneously with the descent of the said follower, by means of the combination of the conveyors, rollers, and cords attached to the same.

"4th, I claim the manner of employing the four upright pillars, with shoulders, in combination with the head block, follower, and circular revolving platform, said pillars being arranged and operating in the manner described, for the purpose of supporting the head block in such manner that it can accommodate itself to the position of the pendant head block during the operation of compressing, without deranging or straining the platform, said pillars playing loosely in boxes let into the platform on which the shoulders rest whilst adjusting the bale for compressing."

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25. For *Improvements in Rope Machinery;* Benjamin Morison, Harrisburg, Dauphin county, Pennsylvania, March 13.

The patentee says,—"The nature of my invention consists in placing the revolving reels, which contain the yarns, at an inclination towards each other at their upper ends, and causing them to revolve upon their axes by means of a bevel pinion secured upon each reel, near its upper end, and working within, or on the inner and under side of a concave stationary bevel wheel, whilst they are being carried round in a contrary direction by the vertical revolving shaft and projecting arms upon which the reels are secured; in providing each of the reels with a changeable tube, adjustable plate, and press block; in the substitution of a sliding spring nipper; in the peculiar manner of constructing the reel, and in the substitution of different sized drawing wheels, with grooved projections, in place of a grooved roller and change wheels, for drawing the various sizes of rope through the machine."

Claim.—"What I claim as my invention, is, 1st, the placing each reel at such an inclination towards the point of 'laying' or combination, as that its whole axis shall be in a direct line with its strand after it leaves the tube and is beginning to be combined, and so that the tubes of the respec-

tive reels shall be almost in contact at their upper ends, just immediately below the nipper blocks, the tube on each reel being a part, and a direct continuation, of the axis of its respective reel.

"2d, I claim the placing of the reels also at a suitable angle of inclination from the right or left of the rope, so that the strand, as drawn out of each tube, has a direction towards the outside of the rope, viz., should a right line be drawn lengthwise through the centre or axis of either reel and continued, it would be in the centre of the strand also, onward to that side of the rope upon which it is being laid, and from which the tube recedes when carried round upon the vertical shaft.

"3d, I claim the use of a concave stationary driving wheel, connecting with the reels by pinions above the bobbins, for giving the necessary counter motion to each reel, as they are carried round by the vertical or main shaft.

"4th, I claim the two thumb screws and elastic levers, in combination with the tubes, arranged as above described, for giving the nipper blocks a more steady and regular pressure or grasp upon the rope.

"5th, I claim the application of the adjusting plate between the press block and tube, the same being secured by means of the mortise or opening through the shaft, and the grooves therein, within which it is made to slide as described."

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26. For an *Improvement in Cooking Stoves;* George E. Waring, Stamford, Fairfield county, Connecticut, March 13.

Claim.—"What I claim as my invention, is extending the hot air chamber under the fire grate, when the top plate thereof is so inclined or curved as to discharge the ashes that fall thereon from the grate, that the said air chamber may be heated by a radiation from the fire on the grate above.

"I also claim making the hot air chamber in two compartments, by a partition perforated at or near the middle of its length, in combination with the perforations in the back plate of the back chamber or front of the oven, and near the ends thereof, that the air which enters the chamber through holes in the side of the stove, may be forced to circulate through the hot air chamber, to be heated before it enters the oven near the sides thereof.

"And finally, I claim, in combination with the method of heating the top of the air chamber, the extension of the bottom flues of the stove, that the products of combustion, in passing around to enter the return flue, may pass under the bottom plate of the hot air chamber, and thus aid in heating the air therein."

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27. For an *Improvement in Curry Combs;* Andrew Hotchkiss, Sharon, Litchfield county, Connecticut, March 13.

Claim.—"What I claim as my invention, is the mode of making curry combs, by constructing their body and teeth out of one solid sheet or piece of metal, by so cutting and bending the said sheet or piece of metal, that, without any material waste, and without the combining and riveting or fastening together separate and detached portions of the structure, I do make a complete body and teeth for the comb. I also claim the entire

form and combination of the parts, to form such a comb as is described and illustrated in and by the said specification and drawings."

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28. For an *Improvement in Ploughs;* William T. Sprouse, Petersburg, Menard county, Illinois, March 13.

The patentee says,—"The nature and object of my invention is to so construct a plough, that a farmer can keep it in perfect repair for a great length of time, himself, without requiring the services of a blacksmith."

Claim.—"What I claim as my invention, is the constructing the share and point of my improved plough of a diamond-shaped flat plate of metal, placed under the mould-board and combined therewith, and with the flanch and standard, (of the casting,) in such a manner that the share plate can be moved forwards to a proper position, as its operating point or share edge wears away by use, without producing the slightest change in the form or position of the winding concave face of the mould-board."

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29. For an *Improved Furnace for Smelting Zinc;* Seth Boyden, Newark, Essex county, New Jersey, March 13.

The patentee says,—"The nature of my invention consists in a double retort, surrounding the fire with the ore, so that the heat has but little chance to escape, except through the ore or object to be heated."

Claim.—"What I claim as my invention, is a combination or double retort or furnace, generating the heat within the vessel or chamber containing the ore to be heated, surrounding the fire chamber or place of combustion with the ore, so that the caloric going off in any direction from the fire, (except down through the grate,) must pass through the ore. With this arrangement merchantable metallic zinc is obtained from the ore, in the proportion of one ton of zinc by four and one-fourth tons of coal."

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30. For an *Improvement in Curry Combs;* William Beach, Philadelphia, Pennsylvania, March 13.

Claim.—"What I claim as my invention, is the shank constructed with the fastening hole therein, made without drilling or welding, and combined with the comb, so as to act as guards to the ends thereof."

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31. For an *Improvement in Smoke-Consuming Apparatus;* F. P. Dimpfel, Philadelphia, Pennsylvania, March 13.

Claim.—"What I claim as my invention, is, 1st, combining with the blowing wheel, which forces the blast into the furnace, and which receives a portion of the products of combustion from the furnace, an auxilliary blower or blowers, to insure the requisite supply of atmospheric air to the main blowing wheel.

"2d, I claim connecting and combining the damper that governs the blast pipe with the dampers that govern the apertures through which the products of combustion enter the fan blower.

"And lastly, I claim making the case that contains the gravel or other impeding medium, of a double cylinder or prism of wire gauze, or the

equivalent thereof, when this is so combined with the chimney as to prevent the escape of the products of combustion, except through the interstices of the said impeding medium."

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32. For an *Improvement in Grain Gatherers;* William Herries, Fayette, Seneca county, New York, March 13.

Claim.—"What I claim as new, is the application and use of the foot lever, acting through the hinges to give a motion to the fingers or teeth, independent of the motion of the handles, for the purpose of throwing the grain into a position over the handles and arms, whereon it may be readily bound into bundles."

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33. For an *Improved Door Lock;* Sylvester M. Pye, Aquackanock, Passaic county, New Jersey, March 13.

The patentee says,—"My improvement consists, 1st, in constructing the talons, (to be operated upon by the large key,) so as to avoid the introduction of the elevating slide No. 4 of my previous lock. 2d, In the introduction of what I call an extension lever, which, when in certain positions, prevents any one on the outside from throwing the bolt or latch. 3d, In the introduction of a movable plate or arm, which, being brought over the keyhole on the face of the cap of the lock, interposes an effectual barrier to the insertion of a key or picks from the outside of the door."

Claim.—"What I claim as my invention, is, 1st, the talons as constructed on the end of the lever 2, herein described, by means of which, and the connecting tumbler when acted upon by the key, the fallers are prevented from acting upon the bolt.

"2d, The interposition of a metallic plate over the keyhole, in the manner represented, in combination with the lever 5, the spring upon it, and the notches in the rim of the lock.

"3d, The pin of the night latch, constructed so as to revolve in its socket."

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34. For an *Improvement in Planing Machines;* Daniel Barnum, (as joint inventor with, and assignee of, Thomas J. Wells,) City of New York, March 13.

Claim.—"What we claim as our invention, is the combination, arrangement, and construction of the double cams, the eccentric clamps, and the rockers, for the purpose of producing an uniform, continuous, and parallel feed motion, without rollers, rack and pinions, endless chains, or any common device, by which means we produce a parallel feed motion, without the expense and friction of ways or slides, whether applied to planing machines or for any other purpose.

"Also, the construction of the fence, or any analogous device, against which to spring or curve a board to be planed, in combination with screw clamps or gauges with proper contrivances, or other means adapted to the curve on the fence, extending each way from the centre of the curve and disk, embracing each line of the fence as far as may be necessary, for the

purpose of receiving the board or plank, by clamping or otherwise acting upon the edges, while it is on the front line of the fence, holding and directing it around the curve, springing and presenting each portion of the board successively to the action of the finishers on the disk, on a curve, and also preventing the finishing portion of the surface from coming in contact with the knives on the back part of the disk, as it passes out of the machine on the rear line of the fence.

"Also, the combination of the armed fence and gauges, or any other device for springing or presenting a board or plank, on a curve, to the action of planes or finishers on a disk, with the disk and long or broad finishers, to extend across the board the entire width, and at right angles with the shaft, for the purpose of planing boards and plank when presented on a curve, thereby finishing them while cutting with the grain, and leaving no circular marks or scores across the board or plank.

"The effects of these improvements are, the production of a new parallel feed motion, without the friction and expense of ways or slides, and also a new method or principle of presenting a board or plank to the action of the knives or finishers, revolving on a disk, on a curve; by which means the finished surface is made while the finishers are cutting with the grain of the wood, thus converting the disk or Bramah wheel, which has hitherto been comparatively of little worth, into a most useful and valuable machine. The tendency of the planing operation with the disk is to move the board edgewise, in the same plane in which the knives revolve, in contradistinction to the Woodworth cylinder, which tends to lift the boards directly up from its bed, as it cuts up and out, from the reduced or planed to the unplaned surface."

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35. For an *Improvement in Looms for Weaving Brussels Carpeting, &c.;* Erastus B. Bigelow, Boston, Massachusetts, March 13.

The patentee says,—"My improvements consist in operating the lathe of the loom, in combination with the trough or grooved bar employed to carry the wires under the warps, in such a manner as to effect the operation of 'clearing the shed.' "

Claim.—"What I claim as new, is, 1st, the moving the trough or grooved bar forwards towards the face of the cloth, when between the warps, for clearing the shed, in the manner above described.

"2d, I claim the said trough or grooved bar, in combination with the lathe of the loom, whether the said lathe be constructed with two pairs of swords, as above described, or in any other way which shall give to the race beam a counter motion, or move the said trough or grooved bar forward between the warps."

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36. For an *Improved Spiral Spark Arrester;* Andrew M'Cleary, Philadelphia, Pennsylvania, March 13.

Claim.—"What I claim as my invention, is the combination of the chamber, containing the wings (*c'*) and wings (*h*), with the openings and volutes, by means of which I am enabled to make sufficient eddies, and throw down the sparks more perfectly than by any other arrangement with which I am acquainted."

37. For *Improvements in Apparatus for Dressing Cloth;* John Johnston and John D. Snyder, Saltsburg, Indiana county, Pennsylvania, March 13.

Claim.—"What we claim as our invention, is the combination of the rotary brushes, shears, steaming apparatus, polishing velvet roller, and other parts, as herein described, with the polished convex metallic rubbers, whereby all parts of the process of finishing a piece of cloth, after it leaves the fulling mill, are simultaneously and continuously performed."

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38. For an *Improvement in Cotton Batting;* Hamilton B. Lawton, Cohoes, Albany county, and Hiram T. Lawton, Troy, New York, March 13.

Claim.—"What we claim as our invention and discovery, is the method of laying on and covering the entire upper and lower surfaces of cotton batting, that has been merely well picked and spread in a lapper, with a thin sheet or layer of carded cotton, for the purpose of making it smooth and strong, thereby fitting it for being packed and pressed, and used for batting purposes, such as beds, mattrasses, &c."

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39. For an *Improvement in Apparatus for Raising and Tilting Water Buckets;* Henry W. Sabin, Reed's Corner, Ontario county, and Luther B. Benton, Penn Yan, Yates county, New York, March 13.

Claim.—"What we claim as our invention, is the combination of the vibrating arms with the cog wheels of the crank shaft, in such a manner that, by the lengthwise movement of the crank shaft, one of the arms is thrown into, and retained in, a horizontal position, for bearing against the rope of the ascending bucket, to steady the same; and also in combination with the strap, by which the bucket is conneted with its rope, serving to turn and guide the bucket so that it will be caught and capsized by the tilting bar."

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40. For an *Improvement in Apparatus for Raising Water;* William T. Barnes, Buffalo, New York, March 20.

Claim.—"What I claim, is raising water by centrifugal force, produced by a combination of inclined planes and fans attached to a shaft, as herein described, using any combination of inclined planes or fans to produce the intended effect."

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41. For an *Improvement in Apparatus for Drawing Water from Wells;* Jehiel T. Farrand, Port Bryon, Cayuga county, New York, March 20.

Claim.—"What I claim as my invention, is the mounting the driving pinion, and the auxiliary reversing pinion which is geared thereto, in bearings rising from the vibrating tumbler; which tumbler is combined with, and operated upon by, the inclined planes rising from the sliding bar, through the medium of a lever."

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42. For an *Improvement in Tide Water Wheels;* Freeman F. Myrick, Lynn, Essex county, Massachusetts, March 20.

Claim.—"What I claim as my invention, is the arrangement of the shaft

in an inclined position, so that while the buckets of the water wheel dip in the water on one side of the wheel, those of the other side become elevated above the surface, in combination with the water wheel, and with the horizontal revolving platform, whereby the position of the water wheel is occasionally changed without disconnecting the gear wheel from the wheel or pinion."

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43. For an *Improvement in Steelyards for Weighing;* Tilley Flint, Westford, and Warren Flint, Chelmsford, Middlesex county, Massachusetts, March 20.

Claim.—"The combination we claim and consider as our invention consists as follows: 1st, the steelyard and scale pan, or any equivalent or equivalents therefor; 2d, the auxiliary scale on the short arm of the steelyard; 3d, the movable bar or its equivalent; 4th, the balancing lever and stirrup of the scale pan; the whole being made to operate together, by means of weights, substantially in the manner and for the purpose specified."

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44. For an *Improvement in Planing Machines;* Daniel Barnum, (as assignee of Thomas J. Wells,) City of New York, March 20.

Claim.—"What I claim as my invention, is the application to the face disk of one or more long or broad plane irons or finishers, embracing the whole width of the board, the inner ends or edges of which being slightly elevated, and which, in their rotations, form or generate a slight cone, in combination with the jacking tools, or of gauges placed upon the periphery, for the purpose of producing a two-fold action: that is, the slight conical cut of the finishers and the perfect disk operation of the jacking tools; thus uniting and claiming the action of the cone and the disk in one and the same planing wheel. I thus produce the effect of the Bramah gauges, in chipping or hewing away the roughest part, the jacking tools revolving in the perfect plane of the disk; and also the effect of the cone, by the slight elevation of the finishers on the end near the shaft; which effect is to finish the surface while the finishers are cutting with the grain of the wood, the shaft being slightly inclined to correspond with the elevation of the knives or finishers. The finishing is thus done with the grain and having no circular mark across the board, and in contradistinction to the finishing operation as was performed by Bramah, his finishers cutting in circular scores across from one edge to the other of the board, leaving the surface indented with them and unfit for use, while I produce a perfectly level and smooth surface, substantially as described and shown."

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45. For a *Machine for Making Percussion Caps;* Richard M. Bouton, West Troy, Albany county, New York, March 20.

Claim.—"What I claim as my invention, is the combination and arrangement of the mechanism above described, for producing the combined operation fully set forth, of feeding the metallic ribbon to the star die, punching the blank from the ribbon, transferring the blank to the forming die by the transferring apparatus, punching the blank into the forming die

and forming it into a cap, and discharging the same from the die by the elevator, and kicking the cap in a finished state from the die bed by the driver; all of said operations being performed successively at every revolution of the crank and cam arbor to which the propelling power is applied, substantially as described.

"2d, I also claim the transferring apparatus, constructed as described, in combination with the punches."

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46. For *Improvements in Carding Machines;* Thomas G. Boone, Brooklyn, New York, March 20.

Claim.—"1st, I claim the weighted roller, in conbination with the feed rollers and the lap cylinder, for the purpose of drawing in cotton, and feeding it to the licker-in in a thinner sheet than is done by carding machines at present in use.

"2d, I claim the aperture and chamber in the casing at (*t*), where the casing projects in near to where the main cylinder card, at its lowest surface, takes the staple from the top or upper surface of the licker-in card, near to such aperture and chamber, as described, and also provided in the casing. And I do claim them, also, in combination with the peculiar placing of such main cylinder directly over the licker-in, so as to bring their place of nearest proximity and action exactly, or nearly, over the centre of the licker-in, and as near to such aperture and chamber as it may safely be placed, in order to discharge such dirt and silicious impurities as may be disengaged by such action, and throwing it through such aperture by the combined motion of both cylinders, without allowing it to fall, either into the cards again, or on to the lap or mat of cotton entering them.

"3d, I claim the arrangement and action of a reducing doffer as my own invention, the same having no action with the main cylinder, but with the doffer, whereby I collect the fibre from the common doffer, though but sparsely scattered thereon, into a thicker sheet or mat, more suitable for a proper delivery by the comb, or other apparatus for stripping or clearing the same. And I claim the same, whether operated by using two such reducing doffers in combination, or by using one only, or in any other way that is substantially the same in principle and effect, in order to collect the staple from a common doffer into a thicker mat, to be taken off by a comb or other stripper.

"4th, I claim a card roller, or top clearing cylinder, moving the impurities disengaged by its lower surface from the main cylinder, on its edge in a direction contrary to the edge and action of the main cylinder, and calculated to take it out from the place of contact without pressing it between itself and the main cylinder, in combination with a beater or stripper, revolving in a manner to clear the same, and deposit the strippings as described."

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47. For an *Improvement in Cooking Ranges;* John M. Dearborn, Boston, Massachusetts, March 20.

Claim.—"What I claim, is the combination of the auxiliary heating chamber, and secondary fire place and flue, with the main fire place spe-

cified, the said secondary fire place being made to receive its air from its side, and through the main fire place."

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48. For an *Improvement in Draining and Blanching Sugars;* John Spangenberg, Jefferson parish, Louisiana, March 20; (anté dated September 20, 1848.)

Claim.—"What I claim as my invention, is the method of bleaching and draining brown sugars on the plantation, as herein set forth: that is to say, blanching the sugar by a solution of molasses and water, both being in the cold state, and the operation being performed in the hogshead destined for the transportation of the sugar to market, thereby increasing the value of the sugar without a corresponding increase of expense."

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49. For an *Improvement in Processes for Burnishing Metals;* Edward Satterlee, Albany, New York, March 20.

The patentee says,—"The nature of my invention consists in covering the surface of the metal or stone to be gilded, with a coating which possesses the properties of adhering firmly thereto, while it readily receives, and strongly retains, the gilder's materials or preparations, and possesses all the firmness requisite to permit the free use of the burnishing tools."

Claim.—"What I claim as my invention, is the mode herein described, of preparing surfaces of cast or wrought iron, or other metals, and stone, so that they may be gilded or silvered in the same manner as wood, and burnished with equal facility, viz., by applying thereto the preparations of shellac and yellow ochre, or other similar and suitable earthy or mineral substance."

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50. For an *Improvement in Portable Hot Air Furnaces;* John P. Hayes, Boston, Massachusetts, March 20.

Claim.—"What I claim as my invention, is the combination of four or more horizontal and parallel smoke flues or chambers, each connected with the one next above it, alternately at the front and then at the rear of the furnace, and the top plate of each chamber having, for the purpose, an opening to establish the connexion with the two exterior diving cold air flues and the central hot air chamber."

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51. For a *Bell Telegraph;* Lucretia Houghton, administratrix of Harvey Houghton, Truxton, Cortlandt county, New York, March 20.

Claim.—"What I claim as my invention, is the combination of the turning tablets with the wires, springs, and levers for turning them, arranged in the manner and for the purpose set forth."

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52. For an *Improvement in Magnetic Telegraphs;* Caleb Winegar, Springport, Cayuga county, New York, March 20.

Claim.—"What I claim as my invention, is moving the paper, on which telegraphic marks are made, into and out of contact with a stationary pen, by which means I avoid the danger of dispersing the ink, which happens

when the pen is rapidly agitated, and also gain the advantage of supplying the ink, while the telegraph is in action, to a pen wholly at rest.

"I also claim operating the magnet which effects the movement of the paper, directly through the main telegraphic circuit, thereby dispensing with the secondary or receiving magnet and local battery.

"I also claim the arrangement for conveying ink to the stationary pen of a marking magnetic telegraph, by means of an adjustable feeder, regulated to correspond in its action with the rate of motion given to the strip of paper on which the telegraphic marks are to be made.

"I also claim the horizontal adjustable supporting stand, in combination with the stationary pen axis, the paper carrier and its adjusting screw, and with the vibrating lever, when employed to adjust the direction of motion of the paper, and allow the marks to be made along its central line."

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53. For an *Improvement in Cotton Cultivators;* Samuel W. Akin, Maury county, Tennessee, March 20.

Claim.—"What I claim as my invention, is, 1st, the grooved board fitted to the scraper and bolted to the beam, for the purpose of protecting the plants from falling clods of earth; and, 2d, in the arrangement of teeth in one beam of the cultivator, and constructing them of different lengths."

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54. For an *Improvement in Air Heating Furnaces;* Oliver Tiffany, City of New York, March 20.

The patentee says,—"The improvement consists in the increased economizing of the heat of the fire that it accomplishes, by the manner of enveloping it in the air to be heated; and in the greater ventilation, at any given temperature of the air, it gives to the rooms warmed, green houses, or kilns; and in the machine-like precision with which it regulates the quantity and temperature of the air heated, and of that which ventilates the rooms."

Claim.—"What I claim, is the manner in which I arrange the furnace, smoke pipe, and air heating spaces, as set forth: that is to say, I claim placing the furnace at or near the centre of the spiral flues and air spaces, the furnace being surrounded on all sides except the back and front.

"I also claim the manner of arranging the valve, in combination with the three flues, for the purposes of heating and ventilation."

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55. For a *Self-Adjusting Railroad Switch;* Erastus C. Matthewson, Hartford, Connecticut, March 20.

The patentee says,—"My improvement consists in so constructing and arranging the parts of the apparatus, and so connecting it with the switch, that, by simply depressing a lever attached to the locomotive or other car, that pries down a rod or other projection, so as to come in contact with a bar supported in an oblique direction with the track; and, by means of this bar being connected with the apparatus that moves the switch, the switch will be moved with perfect accuracy and certainty, if it be not already in the right position, in which case it will not touch the bar."

Claim.—"What I claim as my invention, is the combination of the triangle with the wheel, the detent, the lever and the bars *l* and O, when connected by the bars *d* and *d'*, and the triangle connected with the bars D and E by the bar K, and the wheel connected with the switch by the bar F, or other analogous device, and the corresponding parts, marked D', E', &c., when the train is passing in the opposite direction."

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56. For an *Improved Spring Snap Hook;* Job Johnson, Brooklyn, New York, March 20.

Claim.—"What I claim as new, is the sliding springs with points turning outwards, with or without barbs, in combination with the single spring and hook, or the double spring with hooks, or with the barbed lance."

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57. For an *Improvement in the Manufacture of Paper Veneers;* Charles Walker, Chester, and George Wilson, Weathersfield, Windsor county, Vermont, March 20.

The patentees say,—"The nature of our invention, consists in taking the impression of all kinds of wood upon papar, which, by means of glue or any other adhesive substance, can be placed upon all kinds of wood work."

Claim.—"What we claim as our invention, is the application and use of the type and ink, for the purpose of manufacturing paper veneer, and making an application of it to the purposes herein designated."

After the application of the paper veneer to the work, it is finished by the use of varnish.

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58. For an *Adjustable Cut-Off;* Julius King, Bordentown, Burlington county, New Jersey, March 20.

The patentee says,—"The nature of my invention and improvements consists in so constructing and arranging the levers which lift the valves, and the cams and other apparatus which operate them, that they will open the steam valves, and then close them again, to cut off the steam, when the piston has accomplished any definite portion of its stroke, the feet of the lifting levers being susceptible of such adjustment as will vary the point at which the steam is cut off at pleasure, without either stopping the engine or changing the lead of either the steam or exhaust valves."

Claim.—"What I claim as my invention, is raising the valves by means of the tappets of a revolving shaft, acting against the adjustable sliding or horizontal vibrating levers which raise the valves, whereby the steam can be cut off at any point in the stroke of the piston that may be desired, and the points of cutting it off changed from time to time without stopping the engine.

"I likewise claim reversing the motion of the engine, by means of the clutch-coupling, arranged and operated as herein set forth, and also, by the same means, throwing the cam which operates the valves out of gear, when it is required to work them by hand."

59. For an *Improved Sliding Wrench;* William A. Dodge, assignee of Dexter H. Chamberlain, Boston, Massachusetts, March 20.

Claim,—"What I claim as my invention, is a wrench in which the sliding jaw is moved by two segments of a cylinder, connected with said jaw as set forth, and having screws on their upper ends engaging with the screw on the interior of the hollow cylindrical handle."

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60. For an *Improvement in Planing Machines;* Joseph P. Woodbury, Boston, Massachusetts, March 20; (anté dated September 20, 1848.)

Claim.—"What I claim as new, is, 1st, the combination of endless platforms or bands, as described, above and below the plank, and geared together so as to be forced to move in one direction and with the same velocity, said top platform being held down upon the board by means of the links, with a force varying with the resistance of the cutters, for the purpose of forcing the plank through under the stationary cutters, when used in combination with said stationary cutters.

"2d, I claim the stationary cutters, in combination with the yielding bar mouth pieces.

"3d, I claim the adjustable edge rollers, in combination with the tongueing and grooving cutters, or other stationary edging cutters."

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61. For an *Improvement in Gas Burners;* Daniel H. Solliday, Philadelphia, Pennsylvania, March 20; (anté dated January 9, 1849.)

The patentee says,—"The nature of my invention consists in applying a tube band or ring, or other similar body, near to the orifice of the gas burner, which, by altering the shape or thickness of the flame, and the discharge or force of the stream of gas escaping from the burner, shall increase the light caused by the consumption, out of the same, of any given quantity of gas."

Claim.—"What I claim as my invention, is, in the first place, the application to gas burners of a ring, band, or tube, of any kind, movable or stationary, or made with the said burner out of the same piece, for the purpose of increasing the light, by altering the shape, direction, or force of the stream of gas escaping from a gas burner of any construction whatever.

"I also claim, in the second place, the application of notches to the upper edge of the tube, for the purpose of giving shape or brilliancy to the flame resulting from the combustion of gas from burners to which a tube, band, or other similar body has been applied.

"I also claim, in the third place, the mode of regulating the flame of gas burners having a band, tube, ring, or suitable body, namely, by raising and lowering said tube, band, ring, or other suitable body, by means of a nut and screw, (or slide,) or by any other known means of changing the relative position of the edge of the tube, and the nipple of any kind of gas burner to which my invention may be applied."

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62. For an *Improvement in Hanging Carriage Bodies;* Israel Jackson, West Grove, Chester county, Pennsylvania, March 20.

Claim.—"What I claim as my invention, is the arrangement of a cross

or disk, attached by a pivot to the perch of a spring vehicle, combined with inflexible rods or braces, attached to the body of the carriage, and so disposed on the extremities of the cross, or periphery of the disk, that the oblique action which they produce on one side shall counteract that which they produce on the other; and I claim the application of this my invention, as well to railroad cars and trucks, as to vehicles running on common roads."

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63. For an *Improvement in Surgical Apparatus for Fractured or Injured Ankles;* George W. Yerger, Philadelphia, Pennsylvania, March 20.

The patentee says,—"The nature of my invention consists in securing to the shank and heel of the boot, designed for the fractured or otherwise injured limb, a series of curved, and spring, and jointed bars, corresponding in form, as near as possible, with the parts of the boot to which they are contiguous, extending over the front part and instep, and upward behind, and on the sides of the ankle of the boot, and on the sides of the calf of the leg of the wearer, and attached at this last mentioned part to a pad, corresponding with the form of the calf of the said leg, in such a manner as to cause the weight of the body of the wearer to rest entirely on the lower part of the calf of the leg, and relieve the ankle of all pressure."

Claim.—"What I claim as my invention, is the mode of supporting the ankle when fractured or otherwise injured, at the same time allowing a flexible movement to the same, by means of the before described combination of spring bars and movable stops, shank plates, curved, jointed, and oval bars, and pad or bandage, as described."

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64. For an *Improvement in Springs for Carriages, &c.;* David R. Pratt, Worcester, Worcester county, Massachusetts, March 20.

Claim.—"What I claim as my invention, is the mode of making india rubber springs for carriages and other purposes, by which the several endless elastic belts are successively brought into action as the load is increased, by means of the combination of the concentric endless elastic belts and concentric rows of pins, or their equivalents, the concentric segment rings being connected to the plates attached to the body and running gear of carriages."

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65. For an *Improved Machine for Turning a Lock on Sheet Metal;* Francis Leonard and Daniel Hughes, assignees of John Wright, Rochester, New York, March 20.

Claim.—"What I claim as my invention, is the combination of the bed piece, the tumbler, the folding slide, and lever, for the purpose of turning a lock on sheet iron or other metals."

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66. For *Improved Conical Valve Tuyeres;* Robt. D. Porter, Harper's Ferry, Jefferson county, Virginia, March 27.

Claim.—"What I claim as new, is the giving the movable valve the form of a cone, for the purpose of facilitating the discharge of the ashes

and cinders into the air box and ash pit, and for protecting the valve from being injured by the fire."

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67. For an *Improved Feeder and Nippers for Screw-Cutting Machinery;* William Van Anden, Trenton, New Jersey, March 27.

The patentee says,—"The nature of my invention consists in the construction of a machine for the purpose of cutting or chasing the threads upon bolts or blanks, as they are termed, by means of which they are turned into screws of various kinds."

Claim.—"What I claim as my invention, is, 1st, the permanent vertical feeding tube or shaft, extending from the top of the frame down to a point near the grippers, in combination with the revolving tube and grippers, whereby I am enabled to feed the blanks directly through the said tube on the grippers, without imparting rotary motion to them until they reach the jaws of the grippers, thereby insuring perfect regularity in the feed.

"2d, I claim the peculiar construction of the grippers, in respect to the double action of the jaws, whereby but one screw blank can enter, be held, and discharged at a time, although a series of the said blanks may fill the entire length of the stationary feeding tube."

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68. For an *Improvement in the Clarification of Cane Juices;* John Spangenberg, Jefferson parish, Louisiana, March 27.

The patentee says,—"The nature of my invention, and the great advantage it has over the old methods are as follows: In the first place, it consists in having a greater number of juice boxes, or, otherwise, a number of boxes containing a greater quantity of juice, so that the juice may have more time to deposit its impurities and extraneous matter. Secondly, that, by thus having the juice clarified, or its impurities deposited in the several boxes before it is drawn into the 'grand,' the operation of making the sugar is commenced in the kettles with a hot clarified juice. Thirdly, I use the escape steam for clarifying, although the steam direct from the boiler may be used."

Claim.—"What I claim as my invention and discovery, is, 1st, the direct application of steam, by injection, to the sugar cane juice, whilst in the vats, and before being transferred to the 'grand,' for the purpose of speedily heating, clarifying, defecating, purifying, and freeing the juice of the feculent and other extraneous, injurious, and impure matter, as set forth."

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69. For an *Improvement in Printing Floor Oil Cloth;* Nathaniel B. Powers, Lansingburg, Rensselaer county, New York, March 27.

Claim.—"What I claim as my invention, is the employment of the combination of the gauge and stops, for guiding the printing block without the use of the pitch pins, during the operation of stamping the colors on the cloth, by which the work is rendered much more accurate, and is executed with greater dispatch, and is not so liable to become blurred during the operation of handling the blocks, nor of having the colors to overlap by a misplacement of the blocks."

70. For a *Combined Convex and Concave Auger;* Nathaniel C. Sanford, Meriden, New Haven county, Connecticut, March 27.

Claim.—"What I claim as my invention, is forming the lower part of the plate, from which an augur is to be formed, of a convex shape or even thickness, when this is combined with the upper part of the plate formed of a concave shape; the whole plate being formed for the purpose of making therefrom a double-lipped convex and concave auger."

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71. For an *Improvement in Cooking Stoves;* William E. Bleecker, Albany, New York, March 27.

Claim.—"What I claim as my invention, is the oblique plate under the forward part of the bottom of the oven, when this is combined with the air chamber formed by the oblique plate and the forward part of the bottom oven plate of a cooking stove."

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72. For an *Improvement in Piano Fortes;* James A. Gray, Albany, New York, March 27; (anté dated September 27, 1848.)

Claim.—"I claim the application of weight or pressure upon the sounding board of the piano forte, either directly or upon the crooked bridge thereof, as the most convenient mode of applying the same, for the purpose of producing a change in the tone of the instrument, thereby extending its musical capabilities."

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73. For a *Combination of Adjustable Saddle and Winch;* Abraham G. Polhameus, Nyack, Rockland county, New York, March 27.

The patentee says,—"The nature of my invention consists in the making of a saddle to completely surround the mast of a ship or other vessel, and clasped or hooped together by means of a strong iron band, the ends of which pass through the front half of the saddle board, and are secured by means of strong screw nuts."

Claim.—"What I claim as my invention, is the combination of a winch with a movable and adjustable saddle, connected so that the winch moves with the saddle."

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74. For an *Improvement in Self-Acting Cheese Presses;* Benjamin M. Otis, Cleveland, Cayuhoga county, Ohio, March 27.

The patentee says,—"The nature of my invention consists in the arrangement of two levers, in connexion with certain wheels, in such a manner that a continual and constantly increasing pressure is produced simply by the gravity or weight of the substance to be pressed."

Claim.—"What I claim as my invention, is the combination and arrangement of two levers with their corresponding pairs of pulleys, having cords passing around them to their respective barrels."

75. For *Improvements in Adjusting the Position of Plane Irons, and Regulating the Throats of Planes;* Emanuel W. Carpenter, Lancaster, Lancaster county, Pennsylvania, March 27.

Claim.—"What I claim as my invention, is the regulation of the mouth in planes, so as to enlarge and diminish the same, and for the preservation of a close mouth in planes, by a wedge or bit being placed under the bit and fastened by a screw."

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76. For an *Improved Sash Stopper;* William E. Arnold, Rochester, New York, March 27.

The patentee says,—"The nature of my invention consists in providing a case made of sheet iron or brass, of sufficient size to receive a bolt, in and through which the bolt moves; the shape of the bolt is such that it moves forward by its own weight; the case containing the bolt is applied to the sash by means of a mortise through the sash stile."

Claim.—"What I claim as my invention, is the combination of the case and bolt, for the purpose of holding the sash up or down."

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77. For an *Improvement in Corn Shellers;* Johnston Small, Bridgewater, Beaver connty, Pennsylvania, March 27.

Claim.—"The parts which I claim as my own invention, are the combination of the shute E, cylinder, and shute J, for feeding and shelling the corn, and discharging the cobs."

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78. For an *Improvement in Guides for Warpers;* Whiting Hayden, Windham, Windham county, Connecticut, March 27.

Claim.—"What I claim as my invention, is the application of the principle of contraction and expansion to the 'warper guide,' and for the purpose of accomplishing this, I will make use of a metallic coil of wire."

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79. For an *Elliptical or Oval Truss Frame for Bridges;* James Barnes, Springfield, Hampden county, Massachusetts, March 27.

The patentee says,—"The invention consists in so constructing the truss that the force of thrust and tension to which it is subjected, shall be brought into such relation to each other as to produce the least tendency to fracture."

Claim.—"What I claim as my invention, is the union of the ordinary chords of a truss frame into one continuous elliptical or oval curve, in which the thrusts and tensions of the truss, so constructed, will operate in the manner set forth."

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80. For an *Improvement in Caoutchouc Springs;* Fowler M. Ray, City of New York, March 27.

The patentee says,—"The nature of my invention consists in combining with a spring made of metallic rubber, and in the bore thereof, a helical spring made of metal."

Claim.—"What I claim as my invention, is the combination of helical springs made of metal, with, and placed within, hollow springs made of metallic or vulcanized india rubber, or any equivalent preparation of rubber, whereby the rubber is prevented from spreading laterally, and from chafing against the guide rod, and the tension of the rubber is increased by that of the helical spring."

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81. For an *Improvement in Threshing and Grain Separating Machines;* Israel J. Richardson, City of New York, March 27.

The patentee says,—"The nature of my invention consists in combining and arranging a threshing machine, straw carrier, and riddles, fan and screens, in a compact portable form; the straw carrier being of an entirely new construction."

Claim.—"What I claim as new, is, 1st, the straw carrier, consisting of three or more revolving rakes, so arranged as to cause the straw to turn over in its passage out of the machine.

"2d, I claim, in combination therewith, the apron, as above made known. I also claim the elastic teeth placed opposite the revolving rakes, for lightening the straw, combined with the teeth of said revolving rakes. I also claim, in combination with the above named straw carrier, the revolving apron for conveying the grain to the screen.

"Lastly, I claim the movable lower side rails, and roller attached thereto, for the convenience of moving the machine."

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82. For an *Improvement in Splint Broom Machines;* John Crum and Abraham Larwill; Ramapo, Rockland county, New York, March 27.

Claim.—"What we claim as our invention, is, 1st, cutting a series of splints on, or from, the surface of a block of wood, with a cutter, by a series of cuts in the direction, or nearly so, of the grain of the wood, in combination with a series of intermittent motions, that the splints may be cut in succession one after another along the entire surface of the block.

"2d, Combining with the cutter that forms the splints on the block, one or more slitting cutters, placed at the required distance from the main cutter, that each splint may be divided into two or more parts towards the point.

"3d, The method of forming the splints thicker at the butt than at the point, by moving the block of wood towards the cutter, or the block and cutter towards each other, substantially as described.

"And finally, The method of making the splints on the block shorter as they approach the centre of the block, by changing the position of the block or the cutter, or the range of motion of the cutter."

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83. For an *Improvement in Artificial Manures;* Philip S. and William H. Chappell, Baltimore, Maryland, March 27.

Claim.—"What we claim as our invention, is the residuum from the manufacture of alum, and from the residuum from the manufacture of epsom salts, in composition with any or all of the hereinbefore described materials for the purpose of making the mixture, or a modification thereof, as

hereinbefore described, which said composition or mixture is to be made in the way or manner, and to be used as hereinbefore fully set forth."

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84. For an *Improvement in Grain Separators;* Daniel Woodbury, Perkinsville, Windsor county, Vermont, March 27.

The patentee says,—"The nature of my invention consists in providing a rack which receives the straw as it is thrown from the thresher, while the grain, by its velocity, mostly passes through, and lodges in, shallow chambers of a revolving web or elevator situated directly below said rack, the elevator having projections or pins corresponding to the rods of the rack, and of sufficient length to carry the straw forward above the rack, to be operated upon by an eccentric revolving toothed roller."

Claim.—"I claim the projections or pins on the elevator, in combination with the rack or slat frame. I also claim the combination of the crank with the toothed roller, to give the latter a traverse or side to side motion."

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85. For an *Improvement in Printing Presses;* Jason L. Burdick, Norwich, Chenango county, New York, March 27.

Claim.—"What I claim as new, is, 1st, the manner in which I combine the two cylinders in my printing press with their respective platforms, one immediately above the other, by which each of the cylinders is made to take impressions from the forms on the platform to which it appertains, the lower cylinder perfecting the sheet which has been printed on one side by the upper cylinder and forms.

"I claim the manner of advancing the forms, and of carrying them under the cylinder, by the gearing of the toothed wheels, on the end of said cylinders, into teeth rising up from the edges of the chase or frame in which the form is locked up.

"I claim the manner set forth of constructing the sliding carriages, and of combining them with the platforms, and with the forms sustained thereon; by which construction and combination the form from which an impression has been taken, is made to descend and pass back under the form last elevated, and is itself again elevated and forced forward."

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86. For *Improved Machinery for Drilling Rocks;* Joseph J. Couch, Bridgewater, Plymouth county, Massachusetts, March 27.

The patentee says,—"The object of my improvement is to enable a drill to be placed and operated in any desirable direction."

Claim.—"I claim as my invention, the combination of the bars, or any equivalent therefor, the frame and its journals and slide boxes, as constructed, adapted to one another, and made to operate together, for the purpose of supporting the drill, and directing it into any desired position, as specified.

"I also claim a combination made up of the following elements, viz., 1st, Mechanism for throwing or moving the drill forwards, and drawing it backwards, when it is placed in such a position that it would not be advanced by the action of gravity alone, as it has heretofore been made to operate, the said mechanism being the crank shaft, cranks, and connecting

rods, directly connected with the slide frame, and the supporting and directing frame, or any well known equivalent machinery, applied to produce similar movements of the drill.

"2d, The griping apparatus, or that by which the drill rod is seized or clamped to the drill frame at the proper times, the same consisting of the bearings or jaws, the wedge, lever, and spring, and its cross-bar directly over said jaws.

"3d, The apparatus which causes the jaws to relax their hold of the drill, and set it free or independent of the drill frame, and so that it may be impelled forwards by its momentum, and suffered to recoil without injury to the rest of the machinery, the same consisting of the cam block and its inclined spring; it being expressly understood that I lay no claim to any combination of machinery, so arranged as merely to lift or draw back a drill, and so that it may act or fall against the substance to be drilled by the power of gravity alone, the invention or improvement claimed by me being a combination of such mechanism, and a mechanism for throwing or impelling the drill independently of the power of gravity, in order that the drill may be placed and operated in any inclined position, as well as in a vertical position."

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87. For an *Improvement in Air Heating Furnaces;* Horace Bushnell, Hartford, Connecticut, March 27.

Claim.—"What I claim, therefore, as my invention, is the arrangement of the air heating flues or spaces, in combination with the descending and ascending draft, so that the air to be heated shall enter and come into contact, first, with the coolest portion of the flue, and issue from the warmest into the air chamber."

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88. For an *Improved Canal Steamboat;* Grenville Parker, Worcester, Worcester county, Massachusetts, March 27.

Claim.—"What I claim, is the combination of the paddle wheel, having inclined buckets, with the wave-queller, whereby the boat is propelled with comparatively little disturbance of the water, or abrasure of the banks of the canal, from the action of the wheel."

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89. For an *Improvement in Spring Lancets;* Joseph Ives, Bristol, Hartford county, Connecticut, March 27.

The patentee says,—"The nature of my invention consists in giving the spring lancet an incisory character, mechanically very similar to that which would be produced by the hand of a skilful surgeon; causing the spring lancet, when thrown suddenly from the case by the action of the main spring, to make the incision in an eccentric curve, to any required length and depth, by means of an oblong slit in the lancet, in combination with a fixed stud in the adjustive carriage, to which the lancet is affixed, and on which it moves."

Claim.—"What I claim as my invention, is causing the point of the lancet to sweep in an eccentric curve, simultaneously with its longitudinal movement in the case, by the combind action of the fixed stud in the car-

riage and the oblong aperture in the lancet, by which it is made to cut the vein with an oblique draw-knife stroke, avoiding the tendency to rebound in cutting a tough vein or elastic skin, when thrown forward in a straight line at right angles to the vein; the length of the incision being increased or diminished by changing the position of the stud, and its depth by turning the graduating screw of the carriage."

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90. For an *Improvement in Shading Pictures by Metallic Leaves;* Emanuel Hannon, Cleveland, Cayuhoga county, Ohio, March 27.

Claim.—"What I claim as my discovery, is the shading of gilded pictures by metallic leaves, and by the process described."

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91. For an *Improvement in Dyeing;* Samuel Mallerd, Staten Island, Richmond county, New York, March 27.

The patentee says,—"The nature of my invention consists in preparing and using dyes for the purpose of dying fabrics in a raw or a manufactured state, the same being intended to produce what is termed Prussian blue dye, including the various shades of blue, green, lavender, purple, plum, brown, &c."

Claim.—"What I claim as my discovery, is the peculiar compound of nitrate of potash, or nitrate of soda, and muriate of soda, with the sulphuric acid and coloring matter, by which I make a superior and much cheaper dye than has before been made, to produce such colors in fabrics, when dyed in manner and for the purpose described and set forth."

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92. For an *Improvement in Type Casting Machines;* John J. Sturgis, City of New York, March 27; (anté dated September 27, 1848.)

The patentee says,—"The nature of my invention consists in combining with the nipple of a type casting machine a conical plug or piston valve, which plug valve, by means of an arrangement of levers attached to the frame of the machine, and connected with the plug stem and a cam on the driving shaft, works within a chamber box, forming the back part of the nipple on the inside of the bath."

Claim.—"What I claim as my invention, is the conical plug, and arrangement of the chamber in which it works, in combination with the nipple, and bath, and well of a type casting machine; and also, in combination with the conical plug, I claim the arrangement of the levers and cam, in the manner and for the purpose set forth."

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93. For an *Improvement in Self-Lighting Lamps;* Alexander Bennett, City of New York, March 27.

The patentee says,—"The nature of my invention consists in an improved machine for igniting matches and lighting lamps, by means of a set alarm, or to be actuated by the hand through a variety of means, as described herein."

Claim.—"What I claim as my invention, is the combination of a shaft actuated by springs, which may be relieved from confinement, and turn

the shaft with the disks and match, so as to bring it in contact with the igniting table, and present the blaze of the ignited match to the lamp, and light the same in manner described, by means of an alarm of any kind."

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94. For an *Improvement in Harvesting Machines;* Jonathan Haines, Union Grove, Whiteside county, Illinois, March 27.

Claim.—"What I claim as new, is suspending the frame which carries the conveyor, reel, and cutter, upon the axles of the wheels, when the frame, thus suspended, is hinged to the tongue, and rendered capable of being turned upon its bearings by means of a lever, for the purpose of elevating and depressing the cutter."

RE-ISSUES FOR MARCH, 1849.

1. For an *Improvement in Propelling Ships;* John Ericsson, City of New York; patented December 31, 1848; re-issued March 10.

Claim.—"What I claim as my invention, is the above described location or arrangement of the propeller shaft, in combination with the rudder, made with a slot or recess to admit of the play thereof, in the manner and for the purpose specified.

"I also claim sustaining the propeller abaft the rudder by a swinging or sliding frame, in combination with the shaft made in two parts, in the manner and for the purpose specified.

"And finally, I claim, in combination with the arrangement and location of the propeller shaft, and the hanging of the propeller in a sliding or moving frame, the making of the shaft in two parts."

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2. For an *Improvement in the Saw Mill for Re-Sawing Boards and other Timber;* Pearson Crosby, [no residence given,] patented November 3, 1841; re-issued March 10.

The patentee says,—"The principle or character of the first part of my invention consists in the method of presenting the board to the action of the slitting saw, by pressing it against a rest by means of a pressure roller or rollers, or the equivalent thereof.

"And my invention also consists in the method of straining the saw by means of two stirrups, one secured to the end of the saw towards the back edge, and the other towards the front edge, and these two stirrups, in turn, being connected by a play-joint with a third or straining stirrup, connected with the saw frame or gate."

Claim.—"What I claim as my invention, is the method of presenting, gauging, or guiding the board, by means of the rest and pressure rollers, or their equivalents, in combination with the saw.

"And I also claim the method of hanging and straining the saw, by the combination of three stirrups at the ends of the saw, constructed and connected in manner substantially as herein described."

3. For a *Machine for Sewing Cloth of all kinds with a Running Stitch;* Benjamin W. Bean, City of New York; patented March 4, 1843; re-issued March 10.

The patentee says,—"My invention consists of a combination of gear wheels and a needle, so applied together, and arranged with respect to each other, that the gear wheels, when they are revolved and cloth is passed between them, shall make or form what I term the doubles, or the bends, corrugations, or foldings of the edges of the cloth, necessary for the passage of the needle through it, in order to the performance of the sewing of the running stitch."

Claim.—"What I claim as my invention, is the combination of a straight or curved needle and two or more gear wheels, for forming the doubles or corrugations of the cloth, the whole being made to operate essentially as specified. And, in combination therewith, I claim one or more cogged wheels, applied as specified, and for the purpose of advancing the doubles of the cloth along the needle as above explained.

"I also claim the mode of preventing either retrogradation or any improper movement of the needle, viz., by making it with a crook or bend, and placing against said bend one, two, or more wheels, as described."

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4. For *Improvements in Barrel Machinery;* William Trapp, Jr., Dryden, Tompkins county, New York; patented October 1, 1845; re-issued March 10.

Claim.—"What I claim as my invention, is, 1st, the combination of the slide rest, guided in the manner set forth, with the tool for turning off the cask, constructed and arranged in the manner set forth.

"2d, I also claim the apparatus for chamfering, and howelling and crozing: that is to say, the combination of the cylinder, open at both ends, so that both ends of the cask can be worked off without changing, with the ring chucks for fastening the cask into the cylinder, and with the tools, as herein described, for chamfering and howelling.

"3d, I also claim the crozing tool with the changeable face plate, as set forth.

"4th, I likewise claim the combination of the stock, cutter, adjustable and gauge plate, constituting the tool for turning and smoothing the outside of the cask.

"5th, I likewise claim the peculiar construction of the tool for howelling the cask, as described.

"6th, I likewise claim the peculiar construction of the tool for chamfering the ends of the cask, as described.

"7th, I likewise claim the mode of edging and jointing bilge staves, for making barrel and other bilge work, by the employment of a swing, having a concave or convex bed, in or against which the stave is sprung and secured to the required bilge, in combination with the revolving edging saw and reciprocating straight jointer, or either, whether the said swing frame for confining the stave in its bent position and conveying it to the edging saw and straight jointer, be constructed, arranged, and operated in the

manner set forth, or in any other mode or manner substantially the same, and by which analogous results shall be produced."

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5. For an *Improvement in Preparing Wool and Cotton for Carding;* Geo. L. Mason, Williston, Chittenden county, Vermont; patented September 4, 1847; re-issued March 20.

The patentee says,—"The nature of my invention consists in making the fibres of wool (or other fibrous material) sufficiently soft, pliable, and yielding, for passing through the operations of carding and spinning, by thoroughly penetrating each fibre thereof with steam, just previous to, and during, the operations of carding and spinning, by which I am enabled to dispense with the use of oil for softening the fibres of wool, preparatory to performing the above named operations upon the same."

Claim.—"What I claim as my invention, is the application of heat and moisture to wool by means of steam, for the purpose of rendering its fibres sufficiently soft, flexible, and pliable to pass through the operations of carding and spinning, without requiring the use of oil upon the same.

"I also claim the application of steam to cotton or other soft fibrous substance, for the purpose of giving additional softness and flexibility to their fibres during the operations of carding or spinning."

DESIGNS FOR MARCH, 1849.

1. For a *Design for Stoves;* Henry C. Fay, Troy, New York, March 10; anté dated December 2, 1848.

Claim.—"What I claim, is the production of a new set of stove patterns, described in the accompanying drawing."

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2. For a *Design for Stoves;* Jones & Finney, Pattonsburg, Virginia, assignees of S. W. Gibbs, Albany, New York, March 20.

Claim.—"What I claim as my invention, is the combination and arrangement of ornamental figures and forms, represented in the drawings, making an ornamental design for a cooking stove."

List of American Patents which issued in the month of April, 1849, *with Exemplifications by* CHARLES M. KELLER, *late Chief Examiner of Patents, in the U. S. Patent Office.*

1. For an *Improvement in Spectacle Frames;* Jacob Shaw, Jr., Hinckley, Medina county, Ohio, April 3.

Claim.—"What I claim as new, is combining either one pair, or any desired number of pairs, of glasses or lenses in one frame, so that if a glass or lens be moved, its mate or the other member of the pair will, by means of the interlocking of the teeth of the small wheels, sectors, or gearing, or its equivalent, have an equal or simultaneous motion, and each member of each pair will, at all times, be in a position corresponding with its mate;

and this I claim, irrespective of the manner of uniting the bands which surround the lenses with the connecting arms, or the means of combining the clutch bar with the clutch arms.

"I also claim that part of the apparatus which I have named the clutch arm, composed of a slider-socket and slider, constructed and combined with each other in manner and for the purposes as set forth and described, whether such clutch arms are used in combination with the other parts of the spectacles herein described, or with parts of spectacles of any other description; and this I claim, irrespective of the eye formed on the end of the clutch arm, or the manner or means by which they may be combined with spectacles."

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2. For an *Improvement in Locomotive Baby Tenders;* J. Cutts Smith, Boston, Massachusetts, April 3.

Claim.—"I claim as my invention, all the three upright posts or movable arms, moving in or out, and operated by an increased power spring, for the purpose intended and described."

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3. For *Improvements in Re-Action Water Wheels;* Jesper Smith, Mansfield, Warren county, New Jersey, April 3.

The patentee says,—"The nature of my invention consists in placing valves on the end of the arms of a centrifugal water wheel, whereby the discharge of the water may be changed and the motion of the wheel consequently changed likewise."

Claim.—"What I claim as my invention, is causing water to flow at pleasure in different directions from the centrifugal water wheel or engine, thereby reversing the direction of its revolutions."

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4. For an *Improvement in Planing Machines;* Chas. A. Spring and Wm. H. Derrick, Kensington, Philadelphia county, Pennsylvania, April 3.

The patentees say,—"The nature of our invention consists in the construction and arrangement of the cutter knives or bits, for planing boards and reducing them to a thickness, and also tongueing and grooving the same, all at one operation."

Claim.—"What we claim as new, is, 1st, the combination of the disked cutter wheel and stationary bit in the frame, in the manner and for the purpose set forth."

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5. For *Improvements in Deep Sea Diving Bells;* J. A. Richards and J. A. Wolcott, Boston, Massachusetts, April 3.

Claim.—"What we claim as our invention, is the combination of working rods with the diving bell, by means of ball and socket, or their equivalents, as set forth."

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6. For *Improvements in Rotary Engines;* John C. Howard, Williamsburg, Kings county, New York, April 3.

Claim.—"What I claim as new, is the recess within the circle of the

steam channel, in which is placed an expansion plate, on which the heat can act in the manner and for the purpose set forth, and having the friction of the revolving wheel confined to that part of the stationary case which can be made to expand and contract with said wheel."

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7. For *Improvements in Bank Locks;* Henry C. Jones, assignee of Henry Ritchie, Newark, New Jersey, April 3.

Claim.—"What I claim as new, is the manner of combining the slide with the combined cams or escapement, and with the dog and the pin, for the purposes set forth. I also claim the manner of combining the additional tumbler with the revolving 'scutcheon, under an arrangement and for the purpose herein fully made known."

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8. For an *Improvement in Machinery for Turning Lasts, &c.;* Elbridge Webber and Charles Hartshorne, Gardiner, Kennebec county, Maine, April 3.

The patentees say,—"The nature of our invention consists in turning regular, irregular, and plain figures from reverse patterns and forms."

Claim.—"What we claim as our invention, is, 1st, the method of finishing the heel and toe of the last, by holding the pattern and last in cylindrical holders and removing the centres, and applying the centres simultaneously to the toe and heel.

"2d, We likewise claim the mode of varying the form or fashion of the last whilst turning, by means of the adjustive pawls and pawl wheel, combined with the machinery for operating the reverse patterns, as set forth."

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9. For *Improvements in Machinery for Making Iron Wheel Tires;* Thomas W. Allen and Charles W. Noyes, Greenbush, Rensselaer county, New York, April 3.

Claim.—"What we claim as our invention, is the combination of the drawing-out and forming rollers mounted on the vertical shafts, so geared and arranged that one can be moved towards and from the other, when this is combined with the bed plate for guiding and keeping the edge of the tire true.

"We also claim, in combination with the drawing-out and forming rollers, the employment of the auxiliary roller, for determining the circle of the tire to be formed, when the said auxiliary roller is so connected with the slide of the movable forming rollers, that the auxiliary roller may be adapted to the increasing diameter of the tire as it is being drawn out."

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10. For the *Employment of an Auxiliary Engine in Combination with the Condenser Pump;* John Ericsson, City of New York, April 3.

The patentee says,—"The object of my invention is to condense the steam without admixture with the condensing water, and to condense the steam that escapes from the safety valve, and also for the production of fresh water for any other use."

Claim.—"What I claim as my invention, is the combination of the condenser of a steam engine for the propelling of a ship or other vessel, with a pump that receives the condensing water from outside of the vessel, and causes it to pass the condenser, when the said pump is operated by an auxiliary engine.

"And I also claim the double connexion of the condenser: that is, with the exhaust of the propelling engine, and with the boiler, when the said condenser is combined with a pump that receives the condensing water from outside of the vessel, and is impelled by an auxiliary engine."

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11. For an *Improved Auger Stock;* William T. Barnes, Buffalo, Erie county, New York, April 3.

Claim.—"What I claim as my invention, is, 1st, the combination of the revolving adjustable handles with the stock.

"2d, The combination of the turning collar, on the shank of the auger, with the stock, the collar to be grasped in the hand to guide the auger, when beginning to bore a hole, while being turned by the handle, adjusted so as to operate in the manner of a winch, whereby the auger is more steadily held, and more readily entered into the wood."

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12. For *Improvements in Raising and Conveying Water;* John J. and Saml. P. Cox, Shippensburg, Cumberland county, Pennsylvania, April 3.

The patentees say,—"The nature and principle of this invention is to send a bucket from a house on an inclined rail made of wire or stout rope, and to have the bucket drop into the well to be filled with water, then drawn up again and carried back to the house up the inclined rail; the whole movement being directed by the unwinding and winding of the cord to which the bucket is attached, over a drum or pulley operated by a handle."

Claim.—"We claim the combination of the spring cams with the cap pieces of the carrier, the slide and the bucket top, for holding and releasing the carrier.

"We also claim the spring fork, in combination with the bucket ring and the upright rod or arm, to hold and release the bucket, and to catch again into the ring of the bucket at proper times."

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13. For an *Improvement in Saws;* Ebenezer Clark, Rushville, Schuyler county, Illinois, April 3.

Claim.—"What I claim as my invention, is the movable and loose teeth, in any kind of saw, regardless of shape or form, or manner of insertion, for I am aware that they can be made in other shapes, and placed in blades made different, that would answer as well."

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14. For *Improvements in Machinery for Picking Wool, &c.;* Reuben Daniels and Albert G. Dewey, Woodstock, Windsor county, Vermont, April 3.

Claim.—"What we claim as our invention, is the forming of the concave of a series of rolling bars, geared together at the ends, in the manner

and for the purpose specified, in combination with the picker cylinder; and finally, we claim, in combination with the picker cylinder, the slow-turning rollers placed above the delivery, substantially in the manner and for the purpose specified."

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15. For an *Improvement in Boot Crimps;* Sardius Pasco and Elihu Perry, Cato, Cayuga county, New York, April 3.

The patentees say,—"The nature of our invention consists in the arrangement and combination of the movable parts of the crimp, and the clamp or vise gripe for holding the leather."

Claim.—"What we claim as new, is the combination and arrangement of the movable parts of the clamp with the stationary part, in the manner set forth."

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16. For an *Improved Awl Haft;* Wm. A. Dodge, West Cambridge, Massachusetts, assignee of Dexter H. Chamberlain, Boston, Massachusetts, April 3.

Claim.—"What I claim as my invention, is a tool handle or awl haft, having a split shaft for the holding of the tool, which is forced outwards by a screw shaft, attached to the underside of the cap, and abuting against the top of said split shaft, as set forth, said screw shaft being worked as specified."

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17. For a *Machine for Paying Seams of Vessels;* Samuel Baker, Portsmouth, New Hampshire, April 3.

Claim.—"What I claim as my invention, is the revolving paying wheel, in combination with the supply box, or with the supply box and feeding wheel, the whole constructed and operating substantially in the manner and for the purposes herein described."

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18. For an *Improvement in Lubricating Compounds;* John Cumberland, Mobile, Alabama, and Wm. P. Cumberland, New Albany, Floyd county, Indiana, April 3.

The patentees say,—"The nature of our invention consists in forming a base for the lubricating mixture, by combining potash or other alkaline substance with fresh water and oil, lard, or resin, (or other oily, fatty or resinous substance,) in such, or nearly such proportions as will neutralize the alkaline properties, and then combining or mixing with the said base more fresh water, and pulverized steatite or other analogous substance.

Claim.—"What we claim as new, is, 1st, the combining of potash, or other alkaline substance, with water and oil, lard, or resin, (or other oily, fatty, or resinous substance,) by the process as herein described, into a neutral or nearly neutral compound, as a base for a lubricating mixture, substantially as described."

19. For an *Improvement in Cooking Ranges;* Frederick S. Merritt, City of New York, April 3.

Claim.—"What I claim as my improvement, is, 1st, the syphon shape of the air chamber, for the purpose of moderating the heat acting on the side of the oven nearest the fire chamber.

"2d, I claim the special arrangement and combination made by me of the ovens, fire chamber, draft, ash pit, and syphon chamber, as set forth."

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20. For a *Machine for Spherifying Bullets or Pills;* Jonathan F. Ostrander, City of New York, April 3.

Claim.—"What I claim as my invention, is the oblique gyration of one hemisphere within another, for the purpose of spherifying any mass of matter in the manner described. I also claim the slot, or any outlet for the purpose of letting out the bullets."

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21. For an *Adjustable Dam or Water Weir;* Milow S. Wheaton, Riga, Monroe county, New York, April 3.

Claim.—"What I claim as my invention, is the combination of the two inclined leaves or float gates, with each other and the paddle gates, the whole arranged as described, between abutments, and forming an adjustable dam and waste weir."

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22. For an *Improved Gold Washer;* William H. Jennison, City of New York, April 3.

Claim.—"What I claim as my invention, is the method of separating gold from earthy matter, by means of a rotating inverted conical pan provided with an internal spiral flanch."

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23. For a *Concentric Centrifugal Gold Washer;* James A. Bull, City of New York, April 3.

Claim.—"What I claim as my invention, is the machine consisting of two hollow vessels of convenient thickness and size, placed one within the other, so as to leave a space between them, and revolving, so as to prepare the gold and mass of other matter with which it is mixed, and also to separate the gold from such other matter, as described."

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24. For an *Improvement in Cast Iron Car Wheels;* Carmi Hart and Nathan Washburn, Rochester, New York, April 3.

Claim.—"What we claim as new, is the combination described, of arms and flanches or plate, said flanches or plate and arms being curved in the manner and for the purposes set forth."

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25. For a *Double Hinged Water Guard;* John Burt, Tiverton, Newport county, Rhode Island, April 3.

The patentee says,—"The nature and operation of my invention consist

of an under guard, so connected and protected by an upper guard as to be kept tight on the threshold of the door, and effectually prevent any wind, water, snow, dust, or small particles of matter, getting under it into the building."

Claim.—"What I claim as my invention, is the double combined guard, with the lower guard hinged to the upper one, and protected by the lip or outside fender thereto attached."

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26. For an *Improvement in Hulling Machines;* Dan Pease, Jr., Floyd, Oneida county, New York, April 3.

Claim.—"What I claim as my invention, is, 1st, the combination of the screw section of the cylinder with the ribbed or toothed section, arranged and operating in the manner and for the purpose set forth."

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27. For an *Improved Bank Lock;* David M. Smith, Springfield, Windsor county, Vermont, April 3.

Claim.—"What I claim as my invention, is a combination of the following elements, as applied to the main bolt of a lock, and operated by a key made with either fixed or changeable bitts, the whole arranged and constructed as explained.

"The first of said elements of combination is a notch, a shoulder, or any mechanical equivalent therefor, made in the main bolt, or otherwise properly applied to it.

"The second of the said elements is the spring dog.

"The third of the said elements is the catch plate or lever plate, turning on a pin projecting from the main bolt, and having a spring affixed to it and the bolt, for the purpose of throwing the plate down into the notches of the slide plates.

"The fourth of the said elements is a series of notched slide plates, arranged within a cylinder or rotating shaft provided with retractive springs, and constructed and made to operate in line of the axis of the cylinder or shaft.

"The fifth and last of said elements is the rotary shaft or cylinder, made as described, and provided with a bitt or stud for operating in a notch made in the main bolt, and for the purpose specified."

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28. For an *Improvement in Brakes for Railroad Cars;* Leverett Treadwell, City of New York, April 3.

The patentee says,—"My invention consists of a truck with runners, of the ordinary shape, constructed in the usual manner, attached to, and placed underneath, the bodies of locomotive and railroad cars."

Claim.—"What I claim as new, is the application of a truck to locomotive and railroad cars, so as to act upon the track rails, in combination with its several parts, constructed as specified, operating in the manner as described and for the purpose set forth."

29. For an *Improved Method of Measuring the Action of the Valves in Direct Action Pumping Engines;* Henry R. Worthington and William H. Baker, City of New York, April 3.

Claim.—"What we claim as new, is the removing or reducing the resistance against the pump piston, in direct action steam pumps, at the proper time in the stroke, by effecting a connexion between the water on both sides of the piston, in order to allow either the momentum of the moving parts, or the expansion of the steam already within the cylinder, or both conjoined, to act as explained, to throw the steam valve across the ports with certainty, whether at high or low speeds.

"2d, We claim the method described of effecting the before mentioned and claimed object, namely, by making two passages into each end of the cylinder, across one of which the piston is forced, opening, by this means, free communication between the two ends of the cylinder."

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30. For an *Improvement in Bedstead Fastenings;* John D. Sanborn, Bennington, Wyoming county, New York, April 3.

The patentee says,—"The nature of this invention consists in securing the rails of the bedstead to the posts, by means of castings secured in the ends of the rails, and entering suitable openings communicating with each other in the posts."

Claim.—"What I claim as my invention and improvement on Gaunt's patented bedstead fastening, is making an oval opening through the tenon of the end rails, through which the tenon on the side rail is passed, and forming a spiral bevel around said opening, against which the beveled projection on the tenon of the side rail acts in the manner of a screw, as it is turned, causing the two tenons thus interlocked to act in perfect unison, and to draw the shoulders of the end and side rails simultaneously against the sides of the posts, and to make perfect joints without the liability of breaking the spiral bevels, said bevels being of great strength, arising from their continuous and unbroken form, the parts sustaining each other around the oval opening, by which a simultaneous movement of the posts towards the shoulders of the rails is effected by simply turning the two side rails."

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31. For an *Improvement in Carriage Springs;* Hiram T. Hyde, Troy, Rensselaer county, New York, April 3.

Claim.—"What I claim as my invention, is, 1st, making the plates of elliptic and other carriage springs of a transversely or diagonally crimped, fluted, or ribbed form, as described, by which they are rendered universally flexible, and can be made of a given strength, with less material and expense than the common elliptic spring.

"2d, The combination of the crimped spring with a semi-elliptic many-leaved spring, in the manner and for the purpose set forth."

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32. For an *Improved Punching Machine;* Stephen Kendall, Kalamazoo, Kalamazoo county, Michigan, April 3.

Claim.—"What I claim as my invention, is the combination of the knuckle

and its attached lever, with the toggle and connecting rods, arranged and acting as described, so that by a motion in one direction, of the lever, the punch can be both raised and depressed."

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33. For an *Improvement in Metallic Pens;* Matthew S. Fife, Philadelphia, Pennsylvania, April 3.

The patentee says,—"The nature of my invention consists in dividing the pen, through nearly its entire length, with a slit, or a slit connected with a slot or hole, for the purpose of facilitating the operation, in its manufacture, of closing the slit and adjusting the nibs. It also consists in so placing the slit that an obliquity, or inclination of the point towards the right, is given to the pen without increasing its size, materially injuring its symmetry, or otherwise rendering it less convenient to use than the common straight pen."

Claim.—"What I claim as my invention, is, 1st, the providing the pen with a slit or opening, extending nearly through its entire length, in the manner and for the purpose described. 2d, And, in combination with such slit, I claim forming an oblique pen in the manner described."

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34. For a *Combination of Ash Trap with Puddling and Re-Heating Furnaces;* Lewis Scofield, South Trenton, Mercer county, New Jersey, and Edward Cooper, City of New York, April 3.

Claim.—"What we claim as our invention, is making a depression in the roof of re-heating or puddling furnaces, arresting the solid particles of coal, ashes, and other matter, upon a space or chamber provided for the purpose, in combination with the heating or puddling bottom or bottoms of re-heating or puddling furnaces, whereby the iron under treatment is protected from the injurious effects of the solid matters carried up from the grate by the draft or blast, as described."

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35. For an *Improved Method of Mounting Porcelain Roses for Doors;* Jas. Bell, City of New York, April 3.

Claim.—"I claim as my improvement, the metallic socket, constructed as described, in combination with a mineral, porcelain, or glass rose, the whole being arranged, adapted together, and used in the manner described."

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36. For an *Improvement in Dress Pins;* William and John Richardson, assignees of Walter Hunt, City of New York, April 10.

Claim.—"My claims in the above described invention are confined to the construction of dress pins, hair pins, &c., made from one entire piece of wire or metal, (without a joint or hinge, or any additional metal, except for ornament,) forming said pin, and combining with it, in one and the same piece of wire, a coiled or curved spring, and a clasp or catch, constructed as set forth."

37. For an *Improvement in Elevating the Tops of Piano Fortes;* Conrad Meyer, Philadelphia, Pennsylvania, April 10.

Claim.—"What I claim as my invention, is the connecting the main portion of the top of a piano to the body or case of the instrument, in such a manner that either its front or rear edge can be elevated at pleasure, to allow a free escape of sound, and enable the performer, at the same time, to see and be seen, to wit: by means of the metallic hinge bars, combined with the said main portion of the top of the piano, and inserted into guiding metallic supports, and steadying grooves or apertures, at each extremity of the instrument, in the manner set forth."

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38. For an *Instrument for Drawing Spikes;* Patrick Bryant, Chesterfield, Hampshire county, Massachusetts, April 10.

The patentee says,—"The nature of this invention consists in curving the end of a metallic bar or rod, provided with a suitable handle at its opposite extremity, downward and outward, and tapering the same so as to bring it to an edge, and attaching to near the edge of the same, by means of a pin or bolt upon which it moves, a curved metallic casting, bent and brought to an edge at one extremity, so as to resemble a bill-hook in its side elevation, and bent at the other end, at right angles, or nearly so, with its lower surface, in such a manner that, when the instrument is brought in proper relation to the nail to be drawn, by bringing the edge of the end of the bar, and the bill-hook edge of the casting, on either side of the same, and resting the straight end of the casting on the surface into which the spike or nail is driven, and depressing the handle of the bar, the spike or nail will be embraced between said edges, and drawn with the greatest facility."

Claim.—"What I claim as my invention, is forming the lower end of the metallic bar (provided with a handle at its opposite end) somewhat after the form of a cima-reversa, and brought to an edge, and attaching to the same, by means of a pin or bolt, a curved slotted casting, made of a bill-hook form at one end, and also brought to an edge at that end, and bent at right angles at the other, in such a manner that, by placing the right angled end of said casting on a solid basis, and grasping the spike or nail between the edges of the casting and bar, and depressing the handle, the spike or nail will be drawn from the material into which it is driven with the greatest facility."

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39. For an *Improvement in Threshing Machines;* Thos. N. Shipton, Lewistown, Mifflin county, Pennsylvania, April 10.

Claim.—"What I claim as my invention, is the peculiar form of the teeth, by which clover seed can be hulled and grain threshed in the same machine, each of said teeth being a combination of a jagged semi-ellipse, a trapezoid, and a shank, as described."

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40. For an *Improvement in Bee Hives;* Stephen Titcomb, Farmington, Franklin county, Maine, April 10.

Claim.—"What I claim, is the manner of combining the upper and lower

rods, or entrance passage, with the main or central hives, as set forth, said rods and passages being long and narrow, for the purpose mentioned, and so constructed that, while the external communication is cut off, the ventilation may still go on by the means described."

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41. For an *Improvement in Tailors' Measures;* John Carpenter, Uniontown, Fayette county, Pennsylvania, April 10.

Claim.—"What I claim as my invention, is the combination, with the square, of the exterior radial arm and the interior radial arm, having thereon the several scales, divided and numbered as represented, for the purpose of protracting garments from measures taken upon the person, in the manner substantially as set forth."

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42. For an *Improvement in Machines for Dressing Stone;* Charles Wilson, Springfield, Hampden county, Massachusetts, April 10.

Claim.—"What I claim as my invention and improvement, is the construction of the staging for carrying the stone, consisting of a movable platform, capable of raising and lowering, in combination with the frame for producing the reciprocating motions, so that these several motions may be had singly or in movements variously combined, in the manner and for the purposes described."

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43. For an *Improvement in the Spring Lancet;* James H. Johnson, St. Louis, Missouri, April 10.

The patentee says,—"The nature of my invention consists in the combination of a spring catch and a counter spring with the shank of the blade of a spring lancet, in such a manner that, at the instant the blade penetrates the vein, its shank will detach the counter spring from its spring catch, causing it (the counter spring) to throw back the lancet blade, and thereby preventing all danger from sudden muscular action at the moment that the vein is penetrated.

Claim.—"What I claim as my invention, is the combination of a counter spring and spring catch with the shank of a spring lancet, in the manner and for the purpose set forth."

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44. For an *Improvement in Hulling Machines;* Daniel Pease, Jr., Floyd, Oneida county, New York, April 10.

Claim.—"What I claim as my invention, is, 1st, the combination of the radial wedge-formed rubbers and the segment wings on the lower end of the cylinder, arranged and operating in the manner and for the purpose set forth.

"2d, I claim constructing the horizontal bed plate of the stationary cylinder with curved segment ribs around the centre of the bed plate, in combination with the radial ribs, arranged and operating in the manner and for the purpose set forth."

45. For an *Improvement in Skiving Leather;* Benjamin S Mathews, Stamford, Fairfield county, Connecticut, April 10.

Claim.—"What I claim, is the combination of the blade, roller, and inclined or horizontal carriage, for pressing down and skiving to a bevel, or to a level or even thickness, the leather, as described.

"2d, I also claim the combination of the eccentric and springs with the clamp, as an apparatus for confining and disengaging the leather, in the manner described."

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46. For an *Improved Nail Plate Feeder;* Hannah and Charles M. Diehl, administrators of William Diehl, Norristown, Montgomery county, Pennsylvania, April 10.

The patentees say,—"The purpose of this invention is to feed the strips of nail plate, from which cut nails are to be formed, to the machine which is to cut and form the nails."

Claim.—"What we claim, is the combination and application of the rack wheel, its axle and the springs upon it and the outside wheel, the ratchet and the two levers for pushing and holding it, and again letting it be drawn back by the weight, in the manner and for the purpose set forth."

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47. For an *Improvement in Cooking Stoves;* Fitch R. Babcock, Westfield, Hampden county, Massachusetts, April 10.

The patentee says,—"The nature of my invention consists in providing a common oven, of cylindrical or other convenient form, with a furnace placed within it. The oven is provided with a perforated plate, upon which are fixed circular revolving tables, and also a short cylinder through which the furnace passes, and also through the centre of the main body of the oven. At the bottom of the furnace is a movable grate operated by a lever; at the top of the furnace is placed a second furnace, for boiling, heating flat-irons, and for other purposes."

Claim.—"What I claim as my invention, is the combination of the perforated plate with the revolving tables and cylinder, for the purposes set forth. I also claim as my invention, the manner of using the movable grate, adjusted by a lever in the bottom of the cylindrical furnace."

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48. For an *Improvement in Shaving Brushes;* William S. Jewett, City of New York, April 10.

Claim.—"What I claim as my invention, is the introduction of the soap by means of the screw and tube, through the handle into the brush, by which it may be fully impregnated; and also the combination, in one, of the box and brush, thereby saving time and trouble, for it is only necessary to wet the brush, and while the lather is making on the face the beard is softened."

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49. For an *Improvement in Planing Machines;* John Levy, City of New York, assignee of Hazard Knowles, Washington, D. C., April 10.

Claim.—"What I claim as new, is the method of holding the board

firmly against the bearing bench or roller of a planing machine, by means of the obliquely placed rotary guides firmly pressed against the edge of the board, and drawing it to the bed in the manner set forth.

"I also claim the oblique rotary guides described, in combination with a cutter wheel, having bevels or offsets around its face, and also with the adjustable plates in front of the smoothing cutters set in its plain face, as set forth."

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50. For an *Improvement in Machinery for Dressing Shingles;* Lewis Stockwell, Sutton, Worcester county, Massachusetts, April 10.

Claim.—"What I claim, is my improved organization or combination of mechanism, for holding, shaving, and discharging the shingle, the same consisting of the following elements, as constructed and made to operate as specified: that is to say, 1st, the knife frames and cutting knives; 2d, the system of pressure rollers and their supporting springs; 3d, the spring holder I; 4th, the bearer; 5th, the spring holder K; 6th, the spring discharging and receiving bars; meaning to claim the spring holders, the bearers, and the spring receiving and discharging bars, in combination with one another, and the cutting planes, and as constructed and made to operate therewith substantially as described."

To be Continued.

MECHANICS, PHYSICS, AND CHEMISTRY.

Lectures on Static or Franklinic Electricity, delivered before the Royal Institution. By PROF. FARADAY.*

(Continued from page 324.)

The *Fifth Lecture* by Mr. Faraday, on Static Electricity, was delivered to a crowded audience. The effects of induction in producing the remarkable phenomena of the Leyden jar, and of the electrophorus, constituted the principal subject of the lecture, but it was introduced by some further explanations of the cause of the rapid emission of electricity from points.

When a cylinder is made smaller at one end than the other, and a charge of electricity is induced in it, the electricity at the larger end has more space to expand in than it has at the other, and it consequently becomes more condensed, and exerts greater power to communicate with surrounding bodies. This effect is increased by diminishing one end of the cylinder to a point; and a metal point was attached to the prime conductor of the machine, for the purpose of showing in how short a time all the electricity is dissipated under such circumstances.

In resuming the consideration of the phenomena of induction, Mr. Faraday explained the effects of the condenser. The condenser is an apparatus consisting of two disks of metal mounted perpendicularly, in such manner that one disk, connected with the earth, may be brought close to the surface of the other, which is insulated. When so placed, a feeble charge of electricity, which is inappreciable by the electrometer, becomes condensed, and is very manifest when the disk connected with the earth is removed;

* From the London Mining Journal, Nos. 720, 721, 722.

the thin stratum of air between the two disks having caused the induction of electricity in the opposing disk. When a plate of glass instead of air is interposed, the effects become much stronger, and such an arrangement forms the elements of the Leyden jar.

The apparatus thus fitted, with a plate of glass between the disks, was charged by the electrical machine, and exhibited, in the density of the sparks emitted on the discharge, and the loudness of the report, the same phenomena as the discharge of a small Leyden jar. In this case the electricity from the machine, communicating with the insulated disk, induced the opposite state of electricity in the disk on the other side, which had a communication with the earth, and the glass, by its non-conducting property, having the power to keep the two electricities apart, a large quantity of electricity was accumulated on the glass; thus, when a communication was made between the two disks, all the effects of the electric shock were produced.

The discovery of the Leyden jar, which gave great stimulus to electrical investigations in the middle of last century, was occasioned by the attempt to confine electricity in a bottle. A small glass bottle having been filled with water, was held by M. Cunæus, of Leyden, while it was being charged; and having put his other hand to the nail which served for the connecting wire, he was greatly terrified at receiving a shock. The experiment was repeated by others, and the philosophers of that day, being much alarmed by the power they had evoked, gave most exaggerated accounts of the effects of the shock. M. Muschenbrock, after experimenting with a small drinking glass, stated that he had been struck on his arms, shoulder, and breast, so that he lost his breath, and was two days before he recovered from the blow, which he would not have repeated for the whole kingdom of France!

The convulsive action of the electric shock on the muscles is, indeed, Mr. Faraday observed, one of the most remarkable phenomena of electricity, and, viewed in relation with the electrical condition of many animals, tends to prove the connexion between electricity and nervous influence.

Small bottles of water, exemplifying the kind of Leyden jars at first employed, were exhibited, and in charging one of them Mr. Faraday received a shock, which, though not great, made him start, for he has not been able, he said, to bring his muscles to stand the effect of an electric shock, nor to receive one without annoyance.

Experiments were exhibited to prove that the charge of a Leyden jar resides in the glass, and not in the tinfoil with which the glass is coated. The metallic coatings of a charged jar were changed without much loss of the charge, and a charged jar, when deprived of its interior connecting wire, manifested no trace of electricity when tested by the electrometer.

The electrophorus affords nearly as curious an illustration of the effects of induction as the phenomena of the Leyden jar. When a flat surface of resin is excited by being rubbed with dry flannel, it induces a large quantity of electricity in an insulated metal disk, from which sparks may be taken an unlimited number of times by repeating the operation of pressing the disk on the resin, touching it with the finger, and then lifting it off by the glass handle. These effects are caused by the electricity induced through the air between the interstices of the surface of the resin; for if the

resin and the metal were perfectly flat and smooth, so as to come into contact throughout, the whole of the electricity would be carried off on the first application of the disk.

Sixth Lecture.—The consideration of the various effects of different modes of electric discharge formed the subject of Mr. Faraday's sixth lecture. The discharge of electricity may take place in a variety of ways and imperceptibly, but its effects are most manifest in what is termed the disruptive discharge, when the accumulative force of the electricity breaks through resisting bodies.

It has been remarked as a singularity in the electric discharge, that the force seems to act from the centre externally in opposite directions, and in passing through a card, for instance, perforates a hole with a burr on each side; this the advocates of the vitreous and resinous theory of electricity have considered confirmatory of their opinions; but in point of fact, as Mr. Faraday said, all forces moving rapidly in one direction produce the same effect; and specimens were shown of metal penetrated by balls, which presented the appearance of a burr on each side.

The disruptive discharge occasions a displacement of the particles of the bodies through which the electricity forces a passage, and it is this sudden displacement, or expansion, which occasions the rending effects of lightning, and not the action of the lightning alone, of the nature of which nothing is known.

The experiment of the electrical mortar, by which a small cork ball is thrown out by passing the charge of a Leyden jar through the enclosed air, was shown, to illustrate the mechanical effect of the spark on air; and a glass tube, filled with water, was broken and shattered, to show the effect of a shock on fluids. The glass tube was estimated to bear a pressure of five atmospheres, yet the glass was shivered near the fracture in a manner to indicate the great activity of the force by which it had been broken. The rending power of lightning, when passing through the fluid and air vessels of a tree, may, therefore, be conceived to be immense, and among other specimens on the lecture table was a large quantity of small splinters, into which an oak tree had been riven by lightning.

To illustrate the heating power of electricity, numerous experiments were made. The firing of gas by a spark from the machine, of powdered resin by the discharge of a Leyden jar, and of a mixture of a chloride with antimony by the same means, were exhibited. Though heat is thus manifestly evolved by electricity, no sensation of heat is experienced when an electric spark or shock is received through the hand, and, as Mr. Faraday demonstrated, ether may be fired by a spark emitted from the finger, and even by ice. Ice, indeed, may in cold weather, when free from moisture, be excited like glass, and will emit sparks that will fire ether.

Some curious exemplifications were given of the different results attending the discharge of electricity under various circumstances. Gunpowder, for example, when unconfined, cannot be exploded by an ordinary electric discharge, the effect being merely to disperse the particles of the powder; but when the discharge is made through a wetted string the gunpowder is exploded. A strip of gold leaf was made part of the same circuit with gunpowder, for the purpose of showing the different effects on each when the

discharge took place rapidly through wires, and when retarded by interposing an imperfect conductor, like water. When the discharge was made through wires, the gold leaf was deflagrated and the gunpowder dispersed, but not exploded; when a wet string was made part of the circuit, the gunpowder was exploded and the gold leaf was uninjured.

Static electricity was used for blasting in mining operations before the mode now adopted for the use of the voltaic battery; for which purpose the wire was ordinarily coated with an insulating substance, to prevent the discharge from taking place through the earth instead of through the wire, but the experiment had succeeded through a length of 150 feet of unprotected wire lying on the grass, proving, on a large scale, that electricity will traverse a long line of a good conductor in preference to taking a shorter course through an imperfect one. Several illustrations of the preference of electricity to the shortest course were given, by discharging a small battery through strips of gold leaf variously disposed on cards, when it was evident, by the deflagration of the gold, that the electricity had taken the shortest path.

There are so many circumstances which vary the discharge of electricity, and thereby alter its effects, that it is extremely difficult to determine the cause of the destructive action of lightning. A comparatively feeble discharge of electricity might, in some circumstances, do more damage than a more powerful one. In one case which Mr. Faraday said he had observed, a house had been set on fire by the melted globules of a copper bell-wire having fallen on some curtains; now if, in such a case, the discharge had not been interrupted, or had been more powerful, the metal might have been deflagrated and dispersed, and the house would not have been set on fire.

The different effects of larger and smaller discharges through a wire of the same size were shown; in one case the metal had been just melted, and the globules of it remained on the paper; in the other case the metal had been deflagrated, leaving a broad mark on the paper, but no remains of the metal. The state of the weather may greatly modify the effects of a discharge. When the bricks of a building, for example, are wet, they serve as imperfect conductors of lightning, and may change its rending force into a heating power; and Mr. Faraday, after two or three trials, succeeded in firing, by the discharge of a Leyden jar, gunpowder placed upon a wet brick.

Seventh Lecture.—The light of the electric spark was the subject to which Mr. Faraday almost exclusively directed the attention of his audience, and the room was for nearly the whole time darkened, to show with greater effect the brilliancy of the light and its intense power. In the first place, the power which it possesses of illuminating opaque bodies was shown, by sending sparks and the discharge of a Leyden jar through ivory and eggs, which became as distinctly illuminated as if composed of ground glass, and had been lighted within by a candle.

The instantaneous character of the light was exhibited by Prof. Wheatstone's arrangement for ascertaining the duration of the light of an electric spark. A concave mirror was made to revolve with great rapidity, and the flame of a candle was first reflected on a screen, to show that with a

continuous light the impression on the retina remains until the circle is completed, and thus a circle of light is represented; but when the electric spark is reflected on the screen, the spark only was visible, without any tendency to spread, however rapidly the mirror was revolved. The flame of the candle and the spark were then together reflected on the screen, when the curious effect was seen of a luminous ring of light produced by the flame, in which luminous circle the electric spark appeared brilliantly distinct, as if the mirror had been stationary.

The duration of the electric spark had been ascertained in this manner not to exceed the five hundred thousandth part of a second. So powerful, indeed, is the light of the electric spark, said Mr. Faraday, that if it were continued even for a second it would destroy the organs of vision. The light of the electric spark is vastly more intense than what is termed the electric light, the latter being an exhibition of the luminous power in a much lower degree of intensity.

Several experiments were shown by passing the electric spark through glass vessels, in which a partial vacuum had been produced. The beautiful flood of purple light that was thus transmitted through a long tube, closely resembled the appearance of the Aurora, and Mr. Faraday observed that the identity of the Aurora with the electric light had now become firmly established, and most of the glorious phenomena of atmospheric electricity can be imitated on a small scale; showing the transition of the Aurora to a falling star, and a flash of lightning in proportion to the density of the air through which the electricity passes. In a perfect vacuum the electricity is conducted with nearly the same facility as through wires, but its track is marked by beautiful irradiations of purple light.

The electric spark is the only light known which has sufficient intensity to restore the luminosity of phosphate of lime. Some of that substance was sprinkled on a hot iron, and it emitted a strong phosphorescent light, which after a short time became extinguished; and Mr. Faraday said nothing could restore this property but exposure to the light of the electric spark, the ordinary electric light being too feeble to have any restorative effect.

Mr. Faraday exhibited the power of static electricity to communicate magnetism. By sending the discharge of a Leyden jar through several needles they became magnets, and by reversing the direction of the discharge the poles of the magnets became changed; those ends of the needles which had been north poles becoming south, and the contrary.

Eighth Lecture.—Atmospherical electricity was the branch of the subject reserved for the eighth and concluding lecture of Prof. Faraday's course, which was rendered more than usually interesting by the practical application of the science in the consideration of the grandest phenomena of nature.

At the commencement of the last century, when little was known of electricity, it had been conjectured that lightning and electricity were identical, but it was not until 1752 that the fact was established by Dr. Franklin, who, by means a kite, was enabled to draw electricity from the clouds. To illustrate the condition of a thunder cloud, a large bundle of long strips of paper, fastened together at one end, was suspended at the top of the

lecture room, and it was electrified by means of a wire connected with the prime conductor of the machine. The strips of paper, apparently repelled from each other, stood out in all directions, and after the action of the electrical machine had been continued for some time, the strips continued in a state of repulsion, even when the prime conductor had been completely discharged, the air in the upper part of the room having become charged by electricity emitted from the ends of the paper, which acted in this respect like so many points.

The electrical state of the air was proved in a very curious manner. A piece of cotton wool, steeped in spirits of wine, was attached to the end of a very long fishing rod, and set on fire. From the flame a wire ran down the rod, and was placed in connexion with the electrometer, and when the flame was elevated to the upper part of the room it attracted the electricity with which the air was charged, and caused the gold leaves of the electrometer to diverge. The electricity in one part having been thus withdrawn, the flame was moved to another part with a similar result. As the strips of paper which were employed to represent a thunder cloud repelled each other with great activity, it might be supposed that a cloud, when electrified, would be dispersed by the repulsive power, but Prof. Faraday observed, that the repulsion of the papers was only apparent, the real cause of their separation being the attraction of the walls and of the ceiling around them, and that if they were in the air, with no solid bodies around, they would all be attracted solely towards the earth,—the superior attractive power would overcome all other attractions, and they would be kept together. It is in this manner that the particles comprising a thunder cloud are prevented from being dispersed by the repulsive power which bodies similarly electrified seemed to exert.

In alluding to the appearances of a flash of lightning, the Professor remarked that its course is never in a straight line, but branches out in the same way that a long spark from the electrical machine does; and though many explanations of this phenomenon have been offered, (among them the resistance of the air,) yet no cause has been assigned for it which is satisfactory to him. Even the cause of the electrical condition of the upper regions of the atmosphere has not, to Professor Faraday's opinion, been satisfactorily explained; for though evaporation by some, and different states of temperature by others, have been adduced as the cause, he thought it was better to admit ignorance than to mislead by unsatisfactory explanations. The long continued peals of thunder resulting from one instantaneous flash of lightning had been for some time a difficulty, but the difficulty vanished when it was considered that a flash of lightning may pass through one or two miles, and that sound travels comparatively slowly; so that the sound caused by the disruption of the air at the commencement of a flash of lightning, cannot reach the ear until several seconds after the first peal of thunder has been heard.

The identification of lightning with electricity has enabled us to place the force of lightning under control, and to conduct it safely to the ground, though in carrying into effect this principle, serious mistakes are frequently made by not having the conductors continuous. The destructive effects that may be produced by the smallest disjunction of the conducting wire, were illustrated by several experiments, and even when good continuous

conductors are used, considerable danger may arise if they be not sufficiently large.

An exemplification of this effect was given by connecting a wire from the prime conductor, with several metallic articles in its course, to the earth, and though in this arrangement the sparks were passing freely through the wire, a jet of gas was inflamed on being brought near the metallic bodies with which the wire was connected.

The influence of induction was shown in a striking manner by mounting a very large metallic globe on an insulated stand, several feet distance from the electrical machine, and whilst sparks were being taken from the conductor, by a ball held near it, the electricity induced in the globe was sufficient to fire a jet of gas. The importance of taking into consideration the influence of induction, when in operation on the large scale of nature, becomes, therefore, the Professor observed, very apparent, and it is of the utmost consequence, it should be borne in mind, in the construction of powder mills, or of other buildings where inflammable materials are contained.

In his concluding remarks, Prof. Faraday adverted to an allusion he had made, at the commencement of the course, to the increasing infirmities of age, and the probability of his resigning; but he said he had met with so much indulgence during the delivery of his lectures, that so long as that indulgence was continued, he would not separate from them. This announcement was received with loud and hearty applause.

For the Journal of the Franklin Institute.

On the Location of Iron Furnaces. *By* Mr. H. Fairbairn.

At this time of depression in the iron manufacture of the United States, and the great improbability that the former high prices of iron will again be obtained, it seems to become a consideration for the American iron manufacturer how far there have been errors in the location of iron works, which may have been the cause of disadvantage in the competition with those British iron establishments which now undersell the native iron of Pennsylvania and the adjoining States; and how far the avoidance of these erroneous arrangements may yet contribute to the returning prosperity and the permanent profitable establishment of a great iron manufacturing interest in this quarter of the United States. Undoubtedly there lies open to the view of the geologist and the practical manufacturer, an immense future field for the making of iron in the regions in the vicinity of the Allegheny mountains, amongst the coal fields of the State of Pennsylvania, where exist, not the same varieties of coal only, but the same iron ores and limestone, as in the similar coal fields of Scotland, Staffordshire, and Wales. The carboniferous geology of Pennsylvania has become another confirmation of the great principle of Humboldt, that the general order of geology is the same all over the world.

But though there is every variety of coals in the interior of Pennsylvania as in the interior of the British lands, yet has there not been founded any one complete iron manufacturing establishment in the localities which answer to those of the establishments in Scotland and Wales. All the es-

tablishments in Pennsylvania are at a distance from the coal fields, and therefore under overwhelming disadvantages in the higher prices of coals, with other disadvantages in the disunited state of the processes of the manufacture, from the ore to the finished bars, rails, hoops, or sheets, all of which are made in the same locality in Great Britain, but nowhere in the United States. Yet on this concentration of the processes in the manufacture of iron all profit depends. It is in vain to compete with the iron manufacturer in Scotland or in Wales if more than one-half of the cost of the bar iron consists in the carriage of the coals and the pig iron through the State of Pennsylvania, all of which expense is saved to the iron manufacturer of Scotland or of Wales.

Thus a manufacturer of railroad iron, in Wales, smelts his pig iron from the ore, puddles and refines the iron into bars, and mills the bars into railway iron, all with the coals dug at the door of his establishment, with the same steam engine throughout all the processes, by the same supervision, in a shorter period of time, with all the other advantages arising from the concentration of capital and labor, in a manufacturing system established on an extensive scale. These are the advantages, and the only advantages, of the iron manufacturer in Wales, and this is the reason that railroad iron can be imported on cheaper terms into the city of Philadelphia than any which yet has been manufactured in the United States.

There are altogether about 14 rolling mills in the United States, and these are almost all closed at the present time. Of these establishments two only, one on the Susquehanna and one on the Schuylkill river, manufacture railway iron through all the stages from the iron ore to the finished rail; and these two establishments are at a distance so great from the coal fields, that all the coals are used at a cost of $3·50 to $3·75 per ton of anthracite coal, and, including the still higher prices of any semi-bituminous coal employed in the puddling furnaces, the price of the coals is fully $4 per ton. These are the best and the only complete establishments in Pennsylvania, the other rolling mills being lower down the Schuylkill river, or in the city of Philadelphia, or they are even so far distant as in New Jersey or the Northern States. All of these rolling mills use pig iron manufactured at a distance, subject to the expenses of carriage and many other expenses between the iron furnace and the rolling mill, and the mills are all worked with anthracite coal, at an average cost of $4·25 per ton, or, with semi-bituminous coals, usually at a cost of $6 per ton, as imported from the Susquehanna river, or from Virginia, or Liverpool, or Nova Scotia, and everywhere at similarly excessive prices for this leading material of the trade.

Estimating the result of this difference in the cost of the coals, it will be found that, to manufacture a ton of railway iron from the pig metal, will require for the process of puddling, refining, milling, and steam power, fully two tons of anthracite coal, or two and a half or three tons of semi-bituminous coals. The cost of these two tons of coals in Philadelphia, or at the average of the location of the existing rolling mills, will be not less than $9, or $5 above the cost of the same coals at Pottsville or elsewhere in the coal fields of the interior of the State.

But were there erected a complete iron establishment at or near Pottsville or Pinegrove, or any other vicinity where coals are at the cheapest

rates, or about $2 per ton, then the saving would be $5 per ton in the coals required in the mere after processes of puddling and manufacturing the rails; but the previous savings would be more than double that amount on the coals which are required for the smelting of the iron from the ore, as compared to the least of the existing establishments, and the total difference would be $10 on a ton of railway iron manufactured in Philadelphia, or at the other average locations of the rolling mills which do not manufacture the iron from the ore.

Thus it is seen that a ton of railway iron could be manufactured $10 cheaper in the coal region than in any place where iron has yet been manufactured in the United States. This is an immense difference, and one which would turn the scale entirely in favor of the American iron manufacturer; and therefore to the coal fields we must direct our attention, for the discovery of the only true localities where iron can be profitably and permanently manufactured in competition with Scotland and Wales.

The coal fields of Pennsylvania and of South Wales are the same in geological formation, anthracite coal degenerating into semi-bituminous coals, and the siliceous carbonates of iron interlying everywhere the seams of coals. There is the same inexhaustible quantity of carbonate of iron in Pennsylvania, the same mountain limestone intervenes in the coal measures, and all the minerals are the same in the carboniferous regions of the old and the new world. The anthracite iron furnaces in Wales are in the vicinity of Swansea, which answers to Pottsville, and the main body of the furnaces are at Merther Twydwell, which is on the semi-bituminous coal formation, and answers to the country about Pinegrove and further towards the west. The iron ores have been found by Mr. Cowling Taylor and other eminent surveyors, to be precisely the same in the coal regions of Pennsylvania and of Wales.

Whilst the main considerations are thus the same in both countries, there are other advantages which seem to be greatly in favor of Pennsylvania, and amongst these is the greater accessibility to the superior iron ores in Pennsylvania than in Wales; for it is to be borne in mind that all the iron manufactured at this time in Wales is of an inferior description, in consequence of the inferiority of the ores, and this disadvantage applies also to the one or two iron furnaces which have yet been erected in the Pennsylvanian region of coals. From hard silicious iron ore only a tough unmalleable and cold short iron can be made, and the richer hematite ores are indispensable for admixture with the silicious ores of Pottsville or of Wales. But in Wales these hematite ores can only be obtained from the north of England, and their expense is so great that this circumstance now threatens the most serious consequences to the trade of Wales. A ton of hematite ore cannot be brought from Ulverston to Merther Twydwell at a cost of less than 28*s.* per ton, and yet so important is it to have hematite for admixture with the native ores, that the character of the Welsh railroad iron is rapidly degenerating in foreign markets, by reason of the impossibility of affording the importation of these ores at the prices for railroad iron which can only now be obtained, in consequence of the low prices established on the Clyde. One eminent firm at Merther Twydwell formerly imported 6000 tons of hematite ore from Lancashire, and this was the cause of the high character of the iron made by that company; but it is certain

that this expensive ore can no longer be obtained when the contract prices of cargo iron have fallen to the present ruinous rates in Wales. Thus it is that the Welsh railway iron is losing its reputation in the markets of the United States, for the absence of the former quantity of hematite ore in the iron causes the rails to be cold short in quality; they are consequently brittle, and become fractured, laminated, and worn out in a comparatively very short time, being considered to be $8 or $10 less valuable than the rails which can be supplied from the rail mills of the United States.

On the other hand, the hematite ores could be obtained at less than one-half of the expense, at Pottsville or at Pinegrove, as at Swansea or any other place in Wales. The hematite, or hepatite, or other rich iron ores, are in boundless profusion in the hills at various distances from the coal regions of Pennsylvania; but taking the average distance at 50 miles, the cost would be only about $2 per ton above the iron ores raised on the spot. About one-quarter of the ore, as hematite, is the best mixture for railway iron, or in various other proportions for all varieties of bar iron, and we therefore see a very important advantage to Pennsylvania in the greater proximity, accessibility, and cheapness of the hematite ores as compared to Wales.

Having in this manner the certainty of the same carbonates of iron, the same limestone, and the same coals, with, also, the certainty of the superior ores at still cheaper rates, let it be now our inquiry how far there are other advantages, or disadvantages, respectively in Pennsylvania or in Wales.

When the improvident location of the iron furnaces may be overcome in the future iron manufacture of Pennsylvania, there will be comparatively few remaining advantages to the iron manufacturer of Wales; for the expenses of labor, though formerly very much higher in Pennsylvania, can no longer be said to be excessively different, as in Great Britain, for the vast influx of emigrants, skilled and unskilled, who are arriving from Europe, have already brought down the rates of labor very considerably below the rates of some few years since. There is found to be little real difference in the cost of mining coals, iron ore, or limestone, at Pottsville or at Merther Twydwell, the better levels in Pennsylvania saving much of steam power and expense for higher wages of miners; and respecting the labor about the furnace, this, in Great Britain, enters at the average rate of 4*s.* into the ton of iron, and allowing the difference to be 50 per cent. greater in Pennsylvania, this will be less than half a dollar per ton higher in Pennsylvania than in Wales. There have always been very exaggerated opinions respecting the difference in the cost of the labor in the iron manufacture in Great Britain and in the United States.

On the other hand, the higher prices of labor are far outweighed by the lower rental of mineral lands in the United States. In Wales or in Scotland, the royalties or rental of minerals enter into the cost of a ton of bar iron at the rate of 10*s.* to 14*s.* sterling, or about 25 per cent. upon the whole cost of the iron, but in Pennsylvania, the rent of the coals, iron ore, and limestone, would not be more than one-half of the same sum per ton of iron, since the coal fields are so extensive, and all property is so much lower in value than in Great Britain, that ages must pass over before any important rise can be anticipated in the value of coals and of mineral lands

in the United States. Respecting the relative value of capital and interest of money, there is also a continually less advantage in favor of the British manufacturer, for the value of money is daily becoming more equalized, by reason of the favorable balance of general trade which has been established since the repeal of the Corn Laws of England, and the consequent large payments for the bread-stuffs of the United States. Some advantage still remains to the British manufacturer, but the amount of the difference on the annual interest of money invested in iron works in Pennsylvania, or in Wales or Scotland, would be found to be an unimportant consideration where there was otherwise a well-located and well-conducted iron establishment in the coal regions of the United States.

There would thus be many and great advantages in changing the location of iron works, and in the concentration of the various processes, from the iron ore to the finished bars or railway iron, which cannot now be made in competition with the iron brought over the Atlantic Ocean, and from places not even so well situated for the manufacture as are the coal regions of the United States.

If the iron manufacturer in Wales, or in Scotland, were to smelt his iron with coals brought from Newcastle-upon-Tyne, and costing 28*s.* per ton, and were to bring his pig iron from Staffordshire, he would be only doing that which is daily seen in Pennsylvania, in the use of Liverpool or Sydney coal, and of Scotch pig iron, in the rolling mills of the Schuylkill river, and he consequently would cease to be able to compete for the supply of iron to the markets of the United States. The carriage of coals for even a few miles has been found to amount to an annual expense which has been fatal to some branches of manufacture in Great Britain, and this consideration is all important with those who are aiming at the restoration and permanent foundation of the great iron business which Nature so evidently has intended to exist in the Allegheny regions of the United States.

Only the finer branches of the iron manufacture can exist in cities, or in localities distant from the supplies of coal. In Liverpool there are large foundries, and a great steam engine building business is carried on, but the heavier parts of the engines are brought from places in the Midland counties, and only the finer parts of the work are manufactured in Liverpool; whilst in London, although myriads of people are employed in manufactures of which iron is the raw material, yet it is in cutlery, in fine castings, and the thousand divisions of business in which the raw material does not enter so largely into the manufactured article as does the skill of the artizan, the presence of the metropolitan market, the fashion, foreign demand, and many other considerations which favor manufacturers in cities and towns. But a bar of railway iron was never made in Liverpool or in London, and none can be profitably made in Philadelphia, which is the Liverpool of the United States. Foundries, cutleries, and all other skilled iron manufactures of endless varieties, might be established with the greatest advantage in Philadelphia, but the pig iron, the bar iron, railway bars, beams for steam engines, and all other heavy and comparatively cheap iron and iron manufactures, only can be furnished from the places where fuel is to be obtained at the lowest rates.

These considerations are now of compulsory importance in the iron interests of Pennsylvania, as it is vain to live in hope of the return of those

high prices of iron which rendered the manufacture of bars profitable in almost any situation, or at any price for coals. The iron manufacture of Scotland is extending against all the adverse circumstances of Great Britain, at this time of commercial depression through the world, and bar iron is becoming amongst the foreign exports of the Clyde. There are advantages in Scotland superior to those of Staffordshire or of Wales, for the hematite ores of Lancashire and Cumberland are almost close at hand for importation to the Clyde, and the position of the iron works of Glasgow is nearer to the Western coast of England, and to the United States and the general foreign markets, and there are, therefore, reasons for apprehending the total destruction of the great iron manufacture of South Wales, and the permanent establishment of low prices of iron through the world.

But when we see that, in Pennsylvania, there are all the grand advantages existing equally as in Scotland, in the coal fields, the iron ores, the limestone; all at lower rates of rental and equal rates of mining; labor not materially higher, and capital not materially more valuable; with every prospect that the advantage will continue to grow greater to the iron manufacturer of Pennsylvania, in both capital and labor; that there is now, and always may be expected to remain, a custom house duty of 30 per cent., or some other important sum, against the foreign iron manufacturer, with the freight and charges across the Atlantic Ocean, and other advantages, it cannot be doubted that the iron manufacture can be established on the most solid permanent foundation on the coal fields of the Central State of the United States.

For the Journal of the Franklin Institute.

The Screw Propeller.

"An ounce of Fact is worth a pound of Fiction."

In perusing the article on screw propellers in the last number of the Journal, by "Helix," I gather the following points as being what he wishes to be understood as advocating:—

1st, That propellers, running, as they do, at a higher velocity, admit of the use of smaller engines, thereby causing a saving of space and weight, as well as being cheaper in first cost.

2d, That the slip of the propeller is but 15 to 18 per cent.

3d, That the machinery of propellers, being of less weight and bulk, will allow of a less draft of water, and thereby materially reduce the resistance and increase the speed of the vessel.

4th, In heavy weather, at sea, the advantages of the propeller over the side wheel are very marked; for, while the former is working with uniform power, the latter are being alternately immersed to a great depth, and entirely raised out of water, causing the vessel to *yaw* from side to side, &c.

5th, The propeller, as now used, is not *properly constructed*. The numerous failures that have taken place are caused by a want of knowledge and calculation of the relations which should exist between the means and the end.

After reading the above, one may well inquire by what right a Cunard steamer crosses the ocean in 10 days? or further, why, with a west wind

all the way, she arrives at all, instead of a day or two behind time, when she ought to be at sea, *yawing* about, with one wheel in the water and the other *out*? And what is still more presumptuous on their part, the slip of their wheels is but 15 to 20 per cent. Now if we only consider that a portion of the wheel, according to "Helix," is being *dragged* through the water, and the *balance* operating at an angle, and not in a direction opposite to the motion of the vessel, I think we may well say that *that small portion* of the wheel that does the work is entitled to great credit for the exceeding regularity of its performance; and if that portion that *drags* should be cut off, what might not be expected even from side wheels?

In making a comparison between the engines of propellers and side wheel steamers, "Helix" very modestly takes direct action engines for the former, and gives side lever engines to side wheels, although he very well knows (if an engineer) that direct action engines are in common use for side wheels in England, and that, in the very case he has stated, a vessel of 900 tons may have oscillating engines in the space he has given to those for the propeller. I do not claim, however, that proper engines for side wheels can be put in the same space that some form of engines for propellers may be made to occupy, but the difference in space is very far from being what "Helix" would make it appear, and when the following points are considered, all of which *I am prepared to establish* by testimony that will not be questioned even by "Helix," I think that the friends of side wheels may venture to breathe more freely, at least until they are again demolished, or until the appearance of a screw propeller *properly constructed*.

1st, That the models of vessels with the screw are, of *necessity*, cut away at the stern, and that this reduction of displacement is from 5 to 10 per cent. of the capacity of the vessel, and that the loss of stowage from this necessary evil is greater than the difference of size and weight between the engines of the different vessels.

2d, That the loss of steam by the use of small engines running at high velocities, as recommended by "Helix," is *double* what it will be in a paddle wheel steamer of the same size.

3d, That propellers do not admit of a lighter draft of water than side wheel steamers, it being a well established fact that even moderate success with them is connected with more than the ordinary draft for vessels of the same class using side wheels.

4th, That in no case has the screw any advantage over the side wheel as a means of propelling; that with the wind abaft, abeam, or ahead, the side wheel is the best; and that its advantages are most fully seen with the wind ahead, that being the point where all *theoretical* screw men claim the advantage; and in proof of this I adduce,

5th, That the slip of all sea propellers in this country, in heavy weather, with wind ahead, is from 50 to 60 per cent., as shown by their authentic log books. That the "Princeton" will fall off but 4 revolutions of her engine (from 32 to 28) with the wind ahead, while her speed will be reduced from 8 to 4 miles per hour; while the "Mississippi," under similar circumstances, will fall off from 14 down to 7 revolutions; and that while in the "Princeton" they will be using all the steam they can make, in the "Mississippi" they can run with the fire of two boilers banked up.

6th, That what is true about the "Princeton" is also true of the "Legare," "Massachusetts," and all sea propellers where authentic logs are kept.

7th, That the wear and tear of engines for propellers, from their high velocity, far exceeds that for side wheels, being a liberal per centage on treble the difference of cost.

8th, That the side wheel steamers running from New York to Savannah average their trips in less time than the propellers from this port to Charleston, although the difference in distance is 8 to 10 hours in our favor.

9th, That the paddle wheel of to-day is the same as used by Fulton in 1807, and that while, by its aid, we can with certainty cross the Atlantic, and with a regularity and speed that almost surpasses belief, the best efforts of all the *genius* and *talent* of the various advocates for propellers, in this country and in Europe, has not produced a sea steamer of *speed*.

No one is more willing than myself to admit that, for some particular services, propellers may and will be used to advantage. But for packets, steamers to Europe, or sea steamers to any port where speed is an object, and there is any opposition, side wheels will be preferred, defective as they are stated to be. "Helix" *must go to sea;* he must try a passage on both kinds of vessels, in heavy weather if possible, and I think he will agree with me, that the extremity of a sea vessel is not the place for the propelling power. H.

For the Journal of the Franklin Institute.

Particulars of the Steamship "Republic."

This fine steamer, recently finished at Baltimore, and now running between that port and Charleston, is deserving of particular notice, as being the first vessel built in this country with oscillating engines. Her dimensions are as follows:—

Length on deck, 207 feet; breadth of beam, 30 feet; depth of hold, 18½ feet; average draft of water, 11 feet 9 inches; 2 cylinders, 54 inches diameter, 6 feet stroke; diameter of wheel, 25 feet 6 inches; length of paddles, 8 feet 9 inches; depth of ditto, 2 feet 3 inches; dip of ditto, 3 feet 2 inches; average revolutions, 14 per minute at sea; average pressure of steam, 5 lbs. at sea, cutting off at half stroke; fuel per hour, 1680 lbs. of Cumberland coal, with natural draft; 2 boilers, 12 feet wide, 18 feet long, and 8 feet 6 inches high, with 4 furnaces each.

For some years past this form of engine has been coming into favor in England, and it is now used by a large number of river and sea steamers in private service, as well as by many vessels of the British navy. The advantages of the oscillating engine are simplicity, compactness, and a great reduction of weight.

The engines of the "Republic" occupy in the vessel but 10 feet in length, by 20 feet in width, while the ordinary side lever engine would have taken 25 feet in length. This saving of space gives a material increase of room for freight and passengers, and I am credibly informed that the saving in this particular is equal to the expense of coal for the trip. Messrs. Murry & Hazlehurst deserve great credit for their exertions in behalf of this form of engine, as well as for the manner in which they have

executed the work, and it is to be hoped that the Navy Department will be induced to give the oscillating engine that consideration which it deserves.

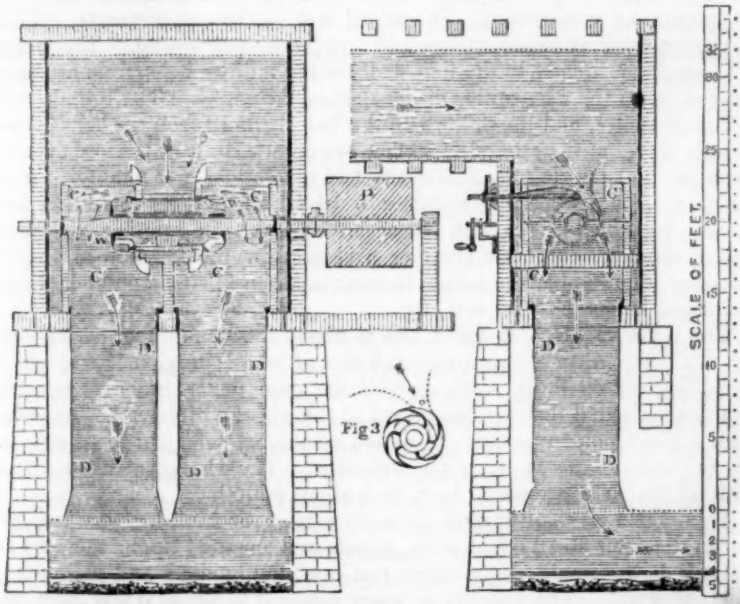
B.

For the Journal of the Franklin Institute.

Parker's Water Wheel.

This important improvement is now extensively in use in nearly every State in the Union. By the most careful scientific tests, and by observations in many instances in which it has been substituted for over-shot and high-breast or pitch-back wheels, it has been fully proved to be more effective in point of economy of water than gravity wheels; while its simplicity, its not being impeded by backwater, or obstructed by ice, its convenience of arrangement for inspection and management, the smallness of the space it occupies, its great durability, its not being liable to get out of order, and its cheapness, especially for great powers, are important advantages not possessed in an equal degree by any other motor.

Fig. 1. Fig. 2.



The above figures represent one of these wheels recently established in the Agawam Canal Company's Cotton Mill, at West Springfield, Mass., fig. 1 being an elevation or vertical section through the axis of the wheel; fig. 2, an elevation across the shaft, representing a section of the penstock and draft tubes, and a profile of the helical inlet; and fig. 3, a section through one of the wheels or rims, showing the form of the curved vanes or buckets. The parts of the drawing have their true proportions according to the scale.

The fall of water operating the wheel is 31 feet; its full power is estimated at 250 horse power, with an expenditure of 6396 cubic feet of water per minute. The wheel consists of a pair of reaction wheels or rims, *w*, of a modified and improved form, arranged on a horizontal shaft, and a double helical sluice, *o*, which conducts the water into the wheels with a lively annular motion in the direction in which the wheel moves. The wheel, with its helical sluice, is placed within the penstock, or reservoir supplying it, and is entirely surrounded with water, the extremities of the shaft only protruding from the sides; its axis is 20 feet high from the surface of the tail water. The water passes from the wheels or rims into two air-tight chambers or cases, *c*, called "draft boxes," from which it passes into two air-tight iron tubes, *d*, called "draft tubes," which terminate and discharge the water beneath the surface of the lower level. The air being entirely excluded from these draft boxes and tubes, and their sections being many times greater than the aggregate openings of the wheel, the water within them descends slowly, being held up by the pressure of the atmosphere on the lower level. It consequently acts by its gravity in giving the water force and velocity, in its passage through the helical inlets and wheel, as effectually as it would if it were over the wheel and acted by its pressure as head water. The wheel is 40 inches in diameter, and, at its proper working speed, makes 220 revolutions per minute. The power is transmitted directly to the line shafts of the mill by belts, from drums or pulleys, *p*, on the extremities of the shaft of the wheel. The drums are 6 feet in diameter, and the pulleys on the line shafts 10 feet; the belts consequently travel at the rate of 4148 feet per minute, or a little more than 47 miles per hour, giving the line shafts 132 revolutions per minute. With the gate, *t*, (which admits the water to the wheel,) a little more than half drawn, the wheel drives with full speed 7000 throstle spindles, and about half of the additional line shafting necessary for the balance of 16,000 spindles, (the number the mill is to contain when filled,) a number of iron and wood lathes, circular saw, &c.

The water required to effect this is about 4500 cubic feet per minute. From a comparison of this result with that of wheels previously erected for propelling cotton mills, working with the gate partly drawn, it is confidently anticipated that the full power of the wheel will drive 13,000 spindles. The Company expect to attach machinery sufficient to require the whole power in the course of a few months. The whole cost of the wheel, with all the parts pertaining to it, was about $5000.

This wheel was substituted for a pitch-back or high-breast wheel, 32 feet in diameter and 17 feet wide, which was operated by the same fall of water. It was made almost entirely of iron, the buckets and soling only being of wood. The quantity of water required to propel it was estimated at 4800 cubic feet per minute. The greatest power that could be got from it was only sufficient for 5000 spindles; another thousand was attached, but it could not be made to drive them with sufficient speed. It was erected early in the present year, and, after running about three months, constantly requiring expensive repairs, it was deemed expedient by the company to remove it, and substitute one of Parker's, which, as yet, appears to the directors and managers of said company to possess many very superior advantages, as compared with the old wheel, there being much

less liability to failure. Another important advantage is in getting up the required speed for the machinery without the use of intervening gearing; thus saving a heavy expense in repairs, and a large amount of oil.

Parker's wheels, in the form here represented, are now in operation in the mills of the following proprietors, to whom those interested are referred for a confirmation of what is here stated.

	Horse power.	Feet fall.
T. F. Plunkitt, Pittsfield, Mass., Cotton Mill,	65	14
J. Barker & Brother, Pittsfield, Mass., Casinet Mill,	15	11
Plattner & Smith, Lee, Mass., Woollen Mill,	45	9
Glendale Woollen Co., Stockbridge, Mass., Woollen Mill,	65	14
Berkshire Woollen Co., Great Barrington, Mass., "	45	9
White & Sheffield, N. Y. City, or Jos. Kingsland, Saugerties, N. Y. } Saugerties, Paper Mill,	140	26
Jos. Bailey, Douglasville, Berks Co., Pa., Rolling Mill,	65	14
New Brunswick Manufacturing Co., J. Stark, Agent, New Brunswick, N. J., Cotton Mill,	38	12
Agawam Canal Co., D. Jakeworth, Agent, West Springfield, Mass., Cotton Mill,	250	31

With the exception of the last mentioned, these wheels have been in operation from one to five years, and so far as has come to the knowledge of the writer, neither of them has required repairing to the amount of a single dollar, nor been out of working order for an hour, since they were first put in operation.

The wheels are manufactured and sold by James T. Sutton & Co., Kensington, Philadelphia county, Pa., O. H. P. Parker, Agent; and by McKay & Hoadley, Pittsfield, Mass., H. D. Burghardt, Agent and Millwright.

Philadelphia, September, 1849.

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*Report on the Causes of the Explosion of Steam Boilers.**

The Rumford Committee, having examined the paper submitted by James Frost, Esq., of Brooklyn, New York, and entitled "Description of the Causes of the Explosion of Steam Boilers, and of some newly discovered properties of heat and other matters, for the purpose of showing that the application of steam for the production of motive force is susceptible both of immense improvement and economy," respectfully report:

The chief points which the author claims to have established are,—

1st, That steam of 212° Fahr., heated, out of contact with water, to 216°, doubles its volume; and heated to 228°, increases its volume threefold.

2d, That steam of low tension, heated to somewhere about 650°, is converted into another body, which the author calls "stame," and which, under favorable circumstances, becomes six times as effective as steam not so heated.

As, in the view of the author, the question of discovery rests upon the truth of the first of these two propositions, the attention of the committee

*Proceedings of the American Association for the Advancement of Science. Second Meeting. Held at Cambridge, Mass., August, 1849.

has been particularly directed to its consideration. To this end, the apparatus employed by Gay-Lussac, in his determinations of the tension of aqueous vapor at different temperatures, was constructed, and a series of experiments made upon steam heated, out of contact with water, from the boiling point to 233·6°. The results arrived at were as follows:

A volume of steam at 212° Fahr., measuring 15·80 cubic centimetres, or 1580 parts, heated to 216°, became 1600 parts, and heated to 228°, became 1630 parts. According to Mr. Frost, 1580 parts at 212° should have become 3160 parts at 216°, and 4740 parts at 228°. In tabular form we have, at

	Exp.	Frost.	Dif.
212°	1580	1580	——
216°	1600	3160	1560
228°	1630	4740	3110

The results for higher, intermediate, and lower temperatures, are given in the accompanying table. The whole expansion of the steam, when heated from 212° to 228°, was a little more than one-thirtieth of its volume at 212°. According to Mr. Frost, it should have been more than ninety times as great as the committee found it to be.

The experiments of the committee were made with steam under a pressure ranging from 24 to 24½ inches of mercury: that is, under less than atmospheric pressure. This condition could not influence the result unfavorably to the view of Mr. Frost, since the less the pressure, the greater is the expansion with a given elevation of temperature.

Centigrade.	Fahrenheit.	Volumes.	Centigrade.	Fahrenheit.	Volumes.
112°·0	233°·6	1644	102°·0	215°·6	1600
111·5	232·7	1642	101·5	214·7	1598
111·0	231 8	1640	101·0	213·8	1592
110·5	230 9	1638	100·5	212·9	1588
110·0	230·0	1634	100·0	212·0	1580
109·5	229·1	1632	99·5	211·1	1574
109·0	228·2	1630	99·0	210·2	1560
108·5	227·3	1628	98·5	209·3	1510
108·0	226·4	1626	98·0	208·4	1430
107·5	225·5	1624	97·5	207·5	1280
107·0	224·6	1622	97·0	206·6	1130
106·5	223·7	1620	96·0	204·9	870
106·0	222·8	1618	95·0	203·0	650
105·5	221·9	1616	94·0	201·2	550
105·0	221·0	1614	93·0	199·4	350
104·5	220·1	1610	92·0	197·6	200
104·0	219·2	1608	91 0	195·8	150
103·5	218·3	1606	90·0	194·0	125
103 0	217·4	1604	70·0	158·0	000
102·5	216·5	1602			

The committee deem it unnecessary to consider farther the claims of the alleged newly discovered properties of heat, as set forth in the pamphlet of Mr. Frost.

E. N. Horsford, *Chairman.*

Report upon an Improvement in Steam Boiler Furnaces, by Henry F. Baker, of Boston, Massachusetts. By THOMAS WICKSTEED, ESQ., *Civ. Eng., Hon. Mem. Royal Cornwall Polytechnic Society, &c.**

Upon the 16th ult., Mr. Amory, agent of the trustees of Baker's furnace, called upon and showed me drawings of the above furnace, and gave me a pamphlet to read which contained a general description of the furnace, and also certificates from several American engineers, testifying the great economy in fuel obtained wherever the new furnace had been introduced, and wished to have my opinion as to its superiority over the furnaces in general use.

I told him that the introduction of "the semi-elliptical chambers or retorts," (instead of straight bridges,) causing "the fire" to be "reverberated upward and backward," was new to me; and that, inasmuch as it checked the draft and retained the heat for a longer period at that part of the boiler where it would produce the greatest effect, I thought a great saving might be obtained over the furnaces in ordinary use; that in fact, by this plan it appeared to me that, with a simple cylindrical boiler of 30 or 40 feet in length, with the chimney immediately at the end of the *first* flue, the same effect would be produced as in the Cornish boilers, where the flues were carried, first, through the inside of the boiler to the farthest end, thence along the sides externally to the front, and thence back again along the under side of the boiler to the chimney; the flame or heated air having, therefore, to traverse the boiler *three* times; and that, if this were the case, the saving in *the first outlay* upon *boilers* and *buildings* would be very considerable, in addition to the annual saving in fuel.

Mr. Amory was very desirous that I should try the new furnace upon the Cornish boilers belonging to the East London Water Works Company. I suggested that, as the principle of slow combustion had been carried out so much farther than usual in the furnaces at Old Ford, it would scarcely be a fair trial; because the combustion was already so slow, that while the fire-doors were open for firing, the flame and smoke came out into the stoke-hole; but that, if he was determined to have a trial made, he must not expect the saving, if any, to be at all equal to that obtained by the introduction of the new furnace into works of the ordinary construction. He, however, resolved to have the trial made; and the result has proved that a considerable saving has been effected, and that he was therefore wise in trusting to this trial.

I may here observe that the statements, published in the pamphlet referred to, showing the very great saving effected in America, should not be rejected without examination, *because* they show very great, and perhaps to some, almost incredible results; the question is not what *per centage* of saving has been effected, but what is the amount of the *ultimate result* obtained. If this be *greater* than experience has hitherto shown, there may be some reason for doubt; if it be not, why should the statements of saving be considered incredible? Now it appears that at three trials, made at three different works, viz., 1st, at Messrs. Heywood & Carne's establishment in Charlestown; 2nd, at the Dry Dock, Navy Yard, at Charles-

* From the London Mechanics' Magazine, for May, 1849.

town; 3rd, at the Portsmouth Cotton Mills; the weight of water evaporated from 212° was, *before* and *after* the introduction of the Patent Furnace, respectively as follows:—

	Before.	After.					
No. 1.	7·367	11·890	showing a saving in fuel of 61 per cent.				
No. 2.	7·558	8·782	"	"	"	16	"
No. 3.	6·260	8·500	"	"	"	35	"

In the first two experiments the coals used were anthracite, and the mean of the two trials will show that 10·336 lbs. of water were evaporated from a temperature of 212° by 1 lb. of anthracite coal; in my experiments, published in 1841, 10·203 lbs. of water were evaporated from a temperature of 212° by 1 lb. of anthracite coal. According to the first report of the royal commissioners "upon Coals suited to the Steam Navy," lately published by Parliament, it appears in Table No. VI., page 15, that they found that 1 lb. of anthracite coal evaporated 9·46 lbs. of water from 212°; and they further observe that a Cornish boiler may evaporate 20 per cent. more than the one used by them in their trials. If this be correct, the water evaporated would be (see Table X., Appendix to their Report) equal to 11·34 lbs. Now taking the average of my experiment, the Commissioners', and the Cornish, the result will give a mean of 10·331 lbs., which happens to be identical with the mean of the two American trials.

As regards No. 3, the description of coal is not given; and in the account of the trial made at the Eagle Furnace, in Albany, the work done previous to the introduction of the new furnace is not given, and therefore no comparison can be made; nor should I be satisfied with the accuracy of a result obtained upon so short a trial as one of thirteen hours' duration. As the ultimate amount of evaporation, given in the three experiments quoted is, therefore, not improbable, there can be no reason for rejecting those statements *because* the saving obtained is so considerable, even as much as 37 per cent. upon the average of the three trials.

Having undertaken to try the effect of the new furnace, as regarded the saving of fuel to be obtained, I have been several weeks prosecuting the inquiry, which was perhaps a longer time than might be considered necessary; but having, from experience, ascertained that *short* experiments are comparatively valueless, I would not undertake to give an opinion without ample time being allowed me; and when it is considered that a variation in the quality of coals from the same heap, their state of dryness, the level of the water in the boiler at the beginning and termination of an experiment, (which, in a high pressure boiler when supplying a steam engine, is, from the oscillation that takes place, very difficult to determine with accuracy,) the state of combustion of the fuel at the beginning and end of a trial, the temperature of the feed water, &c., may and does lead to the most erroneous conclusions, I think it will appear evident that but little reliance can be placed upon *short* trials, and that where there are so many points to be carefully attended to, the longer the duration of the experiments, the greater will be the accuracy obtained. The *shortness* of the trials made *previous* to the adoption of an invention, accounts for the constant disappointments that manufacturers are exposed to, when, after expending large sums of money with the view of obtaining an advantage, they find, after a *longer* trial and further experience, they have not obtained

the promised advantages. A short trial is therefore an injustice to the manufacturer, and it is equally so to the honest inventor, whose plans may thus be rejected on too slight grounds.

I have made these remarks at this length, in order to satisfy the parties for whom I have been making the experiments herein reported; and although I have been cautious in experimenting, and perhaps, also, slow in believing that any saving of fuel could be made by introducing their furnace into the boilers in question, nevertheless this precaution will be of advantage to them, for I think they may fairly conclude hereafter, that if, in some instances, no benefit is derived from the introduction of their furnaces, in such cases the failure may be attributed to some other cause than a defect in the invention.

The experiments were tried upon three Cornish boilers; the outer cases being 6 feet 6 inches diameter, the fire-tubes 4 feet in diameter, and the lengths being 34 feet.

The following regulations were adopted, viz:—

The coals were weighed out every twelve hours.

The clinkers and ashes were weighed every twelve hours.

The temperature of the feed water was taken every hour, day and night.

The water was measured by a metre into the boilers, and the counters were taken every twelve hours; the counters of the engine being taken every twelve hours also; for, as the weight lifted by the engine every stroke was the same, its working formed an admirable *check* upon the other observations.

I made several experiments upon the consumption of fuel with different quantities of air admitted into the flue through the bridge, and the one recorded was the best, each opening in this case being equal to 9 square inches, or, in the aggregate, 27 square inches.

The two experiments recorded in detail were, first, with three boilers *without* the new furnace; and secondly, the same boilers *with* the new furnace.

The coals used were *small* Newcastle coals of *inferior* quality.

Detail of Trial and Results.

	Experiment without the new Furnaces.	Experiment with the Furnaces.
1. Duration of experiment,	207 hours.	108 hours.
2. Coals consumed,	64,940 lbs.	31,642 lbs.
3. Ditto, per hour,	313 lbs.	293 lbs.
4. Water evaporated,	449,320 lbs.	243,860 lbs.
5. Ditto, per hour,	2,170 lbs.	2,256 lbs.
6. Temperature of water before entering boilers,	95·5°	90°
7. Water evaporated per lb. of coals from initial temp.	6·919 lbs.	7·701 lbs.
8. Ditto; from 212° (latent heat 1000°)	7·725 lbs.	8·640 lbs.
9. Clinkers made,	2,597 lbs.	1,428 lbs.
10. Ditto, per hour,	12·50 lbs.	13 lbs.
11. Per centage of clinkers to coals used,	4 per cent.	4·50 pr. ct.
12. Ashes made,	1,298 lbs.	731 lbs.
13. Ditto, per hour,	6·25 lbs.	6·75 lbs.
14. Per centage of ashes to coals used,	2 per cent.	2¼ pr. ct.
15. Coals *minus* clinkers and ashes,	61,045 lbs,	29,483 lbs.
16. Water evaporated per lb. of coals *minus* clinkers and ashes from initial temperature,	7·360 lbs.	8·265 lbs.
17. Ditto, from 212°,	8·217 lbs.	9·278 lbs.